Wireless Association of America

IN THIS ISSUE

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MODERN ELECTRICS

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In This Number

AEROPHONE TESTS BEFORE BRITISH ADMIRALTY
By Dr. Lee de Forest
ELECTRIC DISCHARGES PRODUCING ARTISTIC PHOTOGRAPHS
By Frank C. Perkins
CONSTRUCTION OF STANDARD CELLS
By Walter C. Belcher
CHEMICAL RECTIFIER
By George P. French
CARBORUNDUM DETECTOR
By S. W. Newsom
WIRELESS TROUBLES
By L. Spangenberg
NEW SELENIUM CELL.
ENAMELED WIRE.
WIRELESS HINTS
By Percy L. Palmer
NOVEL DETECTOR.
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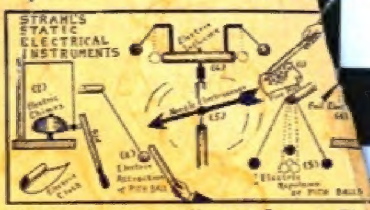

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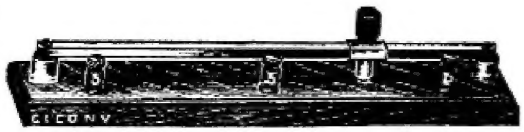

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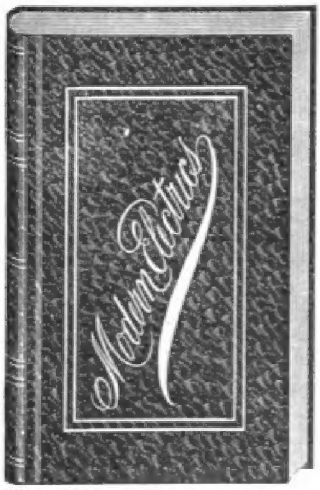

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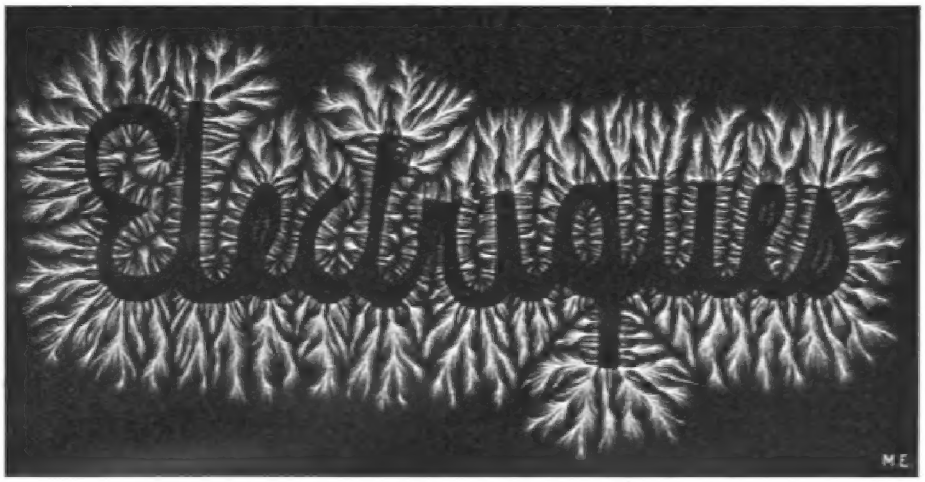
MODERN ELECTRICS

Vol. I. JANUARY, 1909. No. 10.

Electric Discharges Producing Artistic Photographs

By Frank C. Perkins.



At Nantes, France, Dr. Stephane Leduc has made most artistic and unique photographs by utilizing electric sparks and discharges from high tension coils as shown in the accompanying illustrations. The effects produced are not unlike those of the most beautiful crystals of snow or ice, or those given by the kaleidoscope, the more exquisite ornamental figure in its wondrous variety being obtained by this electrical process.

It may be stated that the photographs are used as designs for decorative purposes, various patterns being first provided for general outline, for wall paper, carpet and rug patterns. The outlines of star, letters, figures or other patterns are cut out and placed on the photographic sensitive plate, then metallic oxide, starch or other fine powder is sifted over the sensitive surface of the plate, after which the pattern is taken from the plate, leaving the tracings of the openings on the same, the exposure to the electric discharge being made in the dark room, and the sensitive plate developed as in the case of ordinary negatives exposed to sunlight or other light in a camera.

It will be interesting to note that with these electric photographs no camera is required, as the plate with the outline in fine powder, is placed on the metal foil, tin foil or lead foil being employed joined to the outer coating of one of the Leyden jars of a frictional machine. The other jar of a Wimhurst or other static machine has its outer coating connected to a point placed in the middle of the sensitive surface. The static machine then has its two poles connected to the inner coating of each jar respectively, a screen being provided for protecting the surface of the photographic plate from the discharge of sparks at the machine.

The accompanying illustrations show that most unique and interesting photographic prints are obtained from the negatives after development, the designs being varied according to the patterns used, the arrangement of the power, the strength of current and the form of metallic conductors employed. It is maintained that the tension of the current makes a great difference in the result obtained as well as the temperature and dryness or moisture in the atmosphere.

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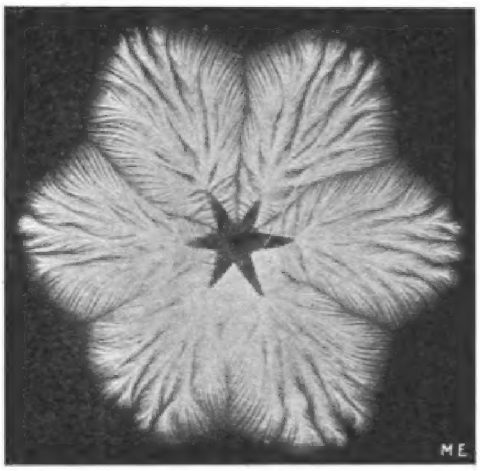
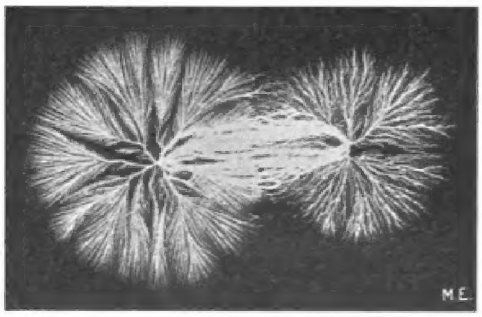
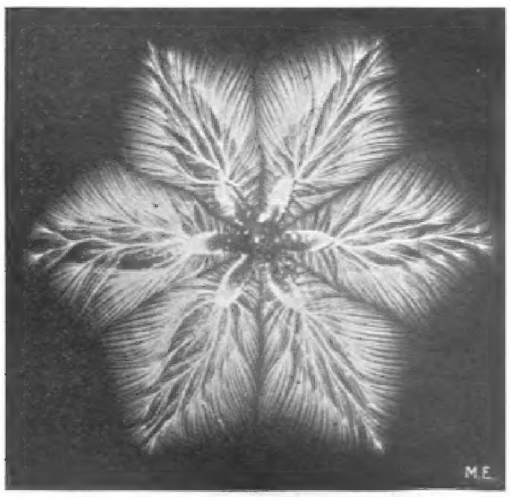


Dr. Stephane Leduc has made some most important investigations of electric fields by this photographic process. Images of electric spectra have been obtained by photographing silent discharges of electricity by placing the metallic point



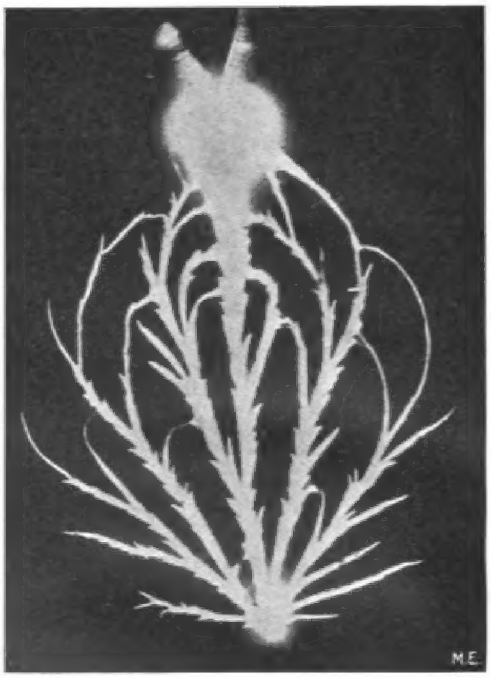
and sensitive plate in the same position as when using the ornamental patterns, the plate and point being again connected to the outside metal coatings of the Leyden jars.

By using a single point a photograph of a monopolar field is obtained, two



points being employed giving a bipolar field, the photographs produced giving somewhat similar designs to iron filings with magnetic fields. The photographs with unlike poles show lines drawing together and connecting the poles, while with poles of the same design, the photograph of the electric discharge resembles the filings outline of two magnetic poles which are alike, either both positive or both negative.

When employing a number of points multipolar electrical fields are photo-



graphed and by placing the points perpendicular to the plate or parallel with the plate most interesting changes are noted in the results. It is necessary to employ non-halation plates in order to avoid the veil due to the spark in many of these experiments, to obtain the best results.

It is held that red oxide of mercury is employed to advantage, the plate being immersed in the compressed oxide while the discharge is taking place. There is also a great difference in the figures produced on the plates if the point is positive and the plate negative, the former connections having been reversed. Some of the most interesting and unique designs of lettering have been produced by this process of photographing electric discharge, with patterns of letters and words.

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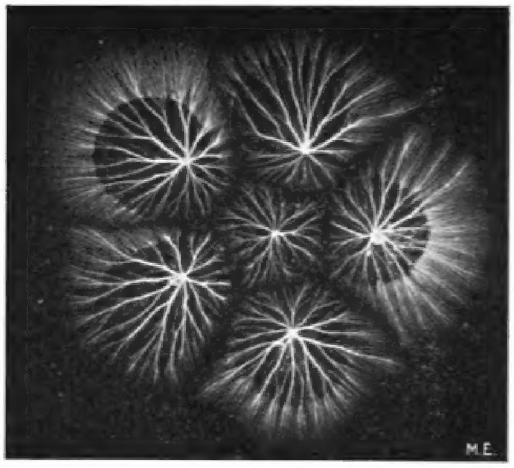
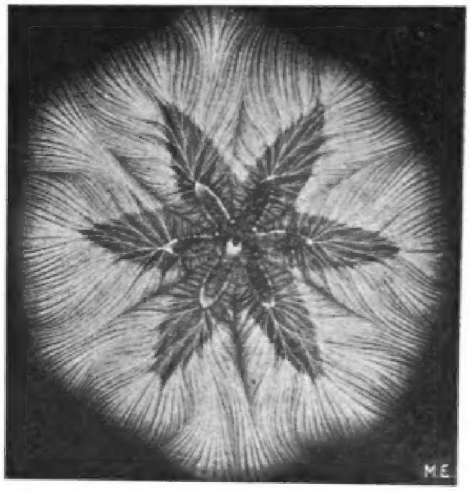
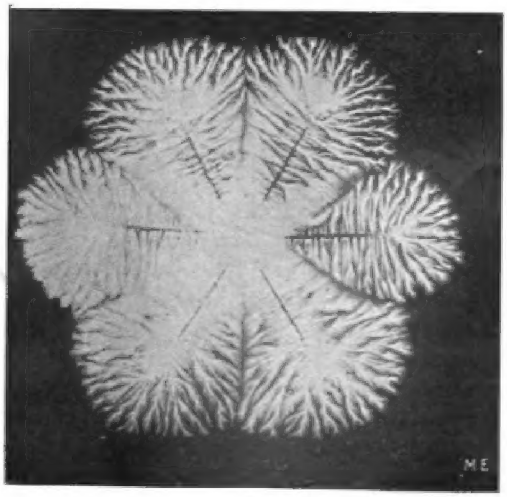


Dr. Leduc has made some valuable investigations of globular electric discharge, the details of which he has pre-



sented to the French Society for the Advancement of Science, under the title: "Etincelle Globulaire Ambulante," and referring to the work of G. Planté and Righi.



BY WIRELESS "ROUND THE WORLD."

By Earle William Gage.

Plans have been announced by Rear-Admiral William S. Cowles, chief of the Equipment Bureau at Washington, D. C., which provide for the eventual establishing of wireless communication around the world, therefore the day is not far distant when Uncle Sam from his chair in the White House can direct the ships of his fleet, no matter in which of the seven seas they may be sailing.

The cornerstone of this stupendous achievement will be laid when work is opened in the near future on a high powered, long-distance wireless station at our national capitol.

Necessity was the inspiration for the undertaking, naval experts say. The United States assumed the responsibility of patrolling the Pacific when the Philippines were taken under the fold of the Stars and Stripes. It is all very well, perhaps, for battleships to sail forth boldly on months-long cruises, but the Government should be in a position to call them up, day or night, and make them feel they are not so far away from motherland after all. It will, indeed, place a cog in our present navy, such as will be hard to equal along general management lines.

High powered stations similar to the one now under construction in Washington will be established along the Pacific coast. The next step will be stations in Hawaii, Guam, Samoa and the Philippines. Wireless communication with ships in the North Atlantic Ocean is now possible to a satisfactory extent. With the future system installed the North Pacific and a portion of the Indian Ocean will be gathered up and figuratively spread out in view of the windows of the White House.

In times of peace the Navy Department will be able to guide the ships at all times with the certainty of a man moving the men on a chess board. Should war arise the responsibilities of a naval engagement need not rest entirely on the shoulders of the men aboard the ships. In a certain room in the White House a board of naval experts will sit and flash wireless messages directing and advising the fleet in fights.

Thus it will be possible to foresee what could not be so in present time, or past times. We can fight at much less cost,

(Continued on Page 363)

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The Construction of Standard Cells

By WALTER C. BELCHER.

Believing that many of the readers of MODERN ELECTRICS are anxious to do exact work, but are hindered by exorbitant prices of Absolute Standards, and by lack of knowledge of methods of construction, the following paper is submitted:

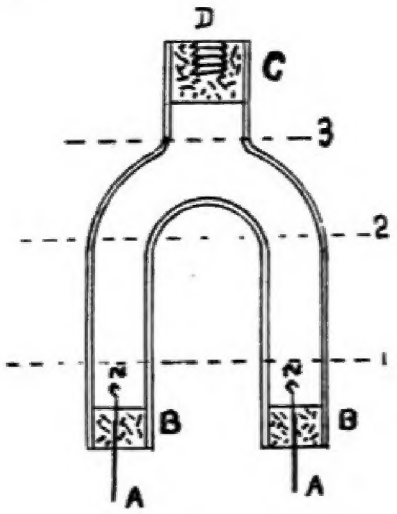

Fig. 1

The Clark-Carhart cell is the legal standard in the United States. There is no local action when not in use. Requires no care when once set up (but is not portable). and is practically constant —the only change in voltage being due to temperature. This change is slight, but for exact work may be found by following formula:

E. M. F.=1.434 [1—0.0008 (T—15)]

The cost is from $3.00 to $4.00.

The cost of construction is about 30 cents, plus time (which is always well spent in scientific pursuits).

Procure as many Y tubes (small size) as you intend to make cells, or if you are proficient in glass blowing you can make them—as their construction is very easy.

Procure as many burned out incandescant lamp globes as you intend to make cells. Break them and carefully remove the platinum lead-in's with the attached copper wire.

Get as many corks as there are legs to your Y tubes, viz., 2 each. Boil them in paraffine. Pierce each in center with a fine needle and draw copper wire of lead-in through until about 1/8 in. only of platinum protrudes, and insert in legs of Y tube as shown at B. It is best to place a bit of paraffine in each leg after insertion and heat carefully above a stove or lamp in order to thoroughly seal the wires in. The copper wires protrude as shown at AA. The platinum at NN.

Be careful that wires NN are *not* paraffined. It is far better yet to seal these wires directly into the glass, as has so often been described in MODERN ELECTRICS, for different types of coherers, only that in this case the platinum tip is internal rather than external, and if you can work glass I strongly advise it.

Now you are ready to make your battery materials.

Buy, or if you are a chemist, make some mercurous sulphate.

Buy or make some zinc sulphate.

Buy some *pure* redistilled mercury.

Make some zinc amalgam as follows: Get a piece of pure zinc, file it up or buy some pure zinc filings. Place in a test tube with a small quantity of mercury and heat. Be careful not to inhale the

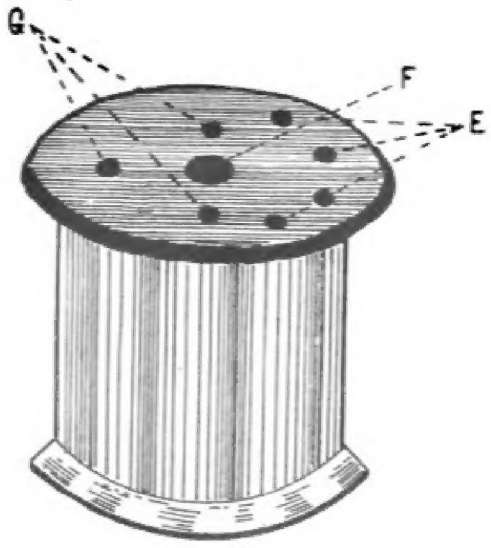

FIG. 2.

fumes as mercury is very poisonous. Add zinc or mercury as needed until you have a thick paste. This is mercury amalgam.

Place with a pipet some mercury in one leg of Y tube up to dotted line 1.

In other leg fill mercury amalgam to

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line 1. Make a thick paste of mercurous sulphate and place in leg in which you put your mercury up to line 2.

Make a saturate solution of zinc sulphate and put in leg in which you put your amalgam and keep filling until you are at line 3.

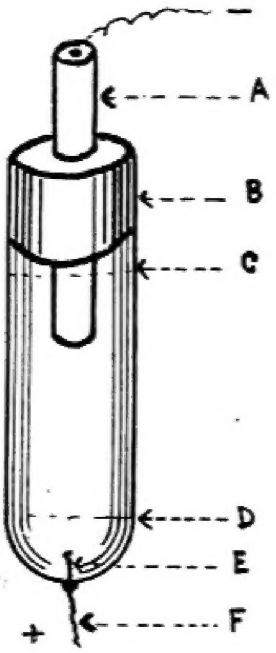


Fig. 3

Place wooden stoppers, previously boiled in paraffine, in C. This stopper is best bored partly through and tapped, as shown at D. This is for permanent suspension.

Now for your case: Fig. 2 shows a very convenient form. The body being of metal and the top of fibre board or hard rubber. This is bored as shown.

Holes G. being for suspension of cells, by screws fitting D. Fig. 1.

F. is for insertion of a thermometer. E. being for your binding posts.

This is on basis of 3 cells, and as you see by connecting cells in series and running *stout* wires from binding post to first and last series and also to 2 connecting loops, you can use 1, 2, 3 cells at will.

Shellac over glass and plug C so as to make a firm joint. Then screw onto top of container.

After having placed your cells and made connections—good soldered ones, mind you—place cap on container and fill container with oil. Kerosene will do.

Use only pure water in making this cell and remember it is for *TESTING ONLY*, not for power or light or continuous use.

To recharge: Siphon off liquid only; drop scrap zinc pieces or filings, into amalgam side and siphon off some of mercury so as to bring down to line 1 on mercury side, and then fill as before.

Each cell of small size requires 1 oz. mercury, 1 oz. mercurous sulphate, 1/4 oz. zinc sulphate, 1 1/2 oz. mercury-zinc amalgam, approximately.

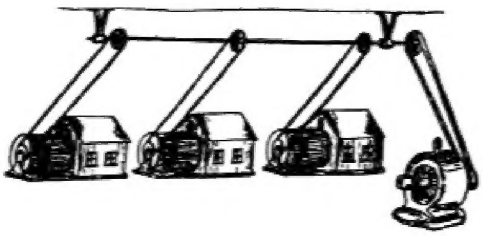
If you do not care to go to the bother of constructing so good a cell a fair substitute is made by sealing a platinum wire into a straight tube as above described, then putting 1/4 in. mercury, then nearly filling with dry mercury sulphate. Plug (or Wollaston) wire about 0.001 in. in with a perforated cork, through which you insert a well amalgamated zinc rod. Shown in Fig. 3. A, zinc rod; B, plug of wood; C, level of mercurous sulphate paste; D, level of mercury; E, platinum wire; F, copper wire.

NOVEL MOTIVE POWER.

By Prof. "Fips."

In the December issue somebody said that somebody had harnessed the ocean. What of it? Look at illustration. I have harnessed the squirrels!

If you live in the woods and wish to light up your house electrically, and if you have no water power nor gas engine, but plenty of squirrels, the problem becomes an easy one. Catch about 455 squirrels (their combined



power is one horse power) and build 455 little houses, with the revolving cages. All these cages are belted to a main shaft, which drives the dynamo.

As the squirrels are liable to go on strike in the evening, the dynamo should be used to charge storage batteries during the daytime.

It has been proposed to term the kilo-watt hour as the "Kelvin." This is in honor of the recently deceased scientist, William Thomson (Lord Kelvin).

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It affords the Editor genuine pleasure to offer to the thousands of wireless enthusiasts an approprite New Year's present in form of the Wireless Association of America. Every reader perusing the announcement of the association, found elsewhere in this issue, will agree that such an organization has been needed for a long time.

Wireless Telegraphy may now be said to have left the experimental stage. It has become an everyday necessity, and already rivals the wire and cable telegraph. Between sea and land wireless is of the utmost importance and to-day forms as necessary an adjunct to every up-to-date vessel, as its coal and lifeboats.

Only a few days ago Wireless demonstrated anew its utility. Several Italian warships were at sea, when the disaster occurred in southern Italy, necessitating prompt assistance by outside help. The warships were at once recalled by means of wireless, and through it have saved the lives of hundreds of sufferers and brought the much needed relief.

Not alone on sea, or between land and sea, but on the mainland also, Wireless is of high importance. Only a few weeks ago two young Wireless experimenters saved several hundred lives in southern France in a dramatic manner. One of the young men, living on a hill near a dam, discovered that it was giving way, which meant the destruction of a small village in the valley below and the drowning of hundreds. He promptly "called up" his friend living in the village below who gave the alarm. Over two hundred people reached the mountain in safety, just in time to avoid the flood. Without Wireless they would have been surely drowned, as telephone and telegraph are unknown in that locality and the person in charge of the dam was sick on account of a recent accident.

The greatest aim of the Wireless Association of America is to bring young experimenters together — not in clubs, but in practical work. The Editor would like to see every reader of "Modern Electrics" ; in possession of a wireless station; there is really nothing more instructive and entertaining than a wireless between two isolated, or for that matter, distant points in a city. The necessary instruments, thanks to competition are now so cheap that they are in reach of everybody, and we have as yet to hear of the person regretting an investment in wireless instruments.

The Association's button will also be of great help to bring young experimenters, unknown to each other, together. As only a few thousand buttons were ordered, prospective members should send at once for same, as it will take several weeks to obtain a new supply.

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Wireless Association of America

Under the Auspices of "Modern Electrics"

Board of Directors

DR. LEE DE FOREST	President
JOHN S. STONE	Vice-President
WM. MAVER, JR.	Secretary
HUGO GERNSBACK	Chairman & Business Manager

The Wireless Association of America has been founded with the sole object of furthering the interests of wireless telegraphy and aerophony in America.

We are now on the threshold of the wireless era, and just beginning to rub our intellectual eyes, as it were. Sometimes we look over the wall of our barred knowledge in amazement, wondering what lays beyond the wall, as yet covered with a dense haze.

However, young America, up to the occasion, is wide awake as usual.

Foreign wireless experts, invariably exclaim in wonder when viewing the photographs appearing each month in the "Wireless Contest" of this magazine. They cannot grasp the idea that boys 14 years old actually operate wireless stations successfully every day in the year under all conditions, but they are all of the undivided opinion that Young America leads the rest of the world wirelessly.

Even Dr. Lee de Forest, America's foremost wireless authority, confessed himself surprised that so many young men in this country should be in the possession of such well constructed and well managed wireless stations, which is only another proof that the clear headed young men of this country are unusually advanced in the youngest branch of electrical science.

So far America has lead in the race. The next thing is to stay in the front, and let the others follow. In fact he would be a bold prophet who would even dare hint at the wonders to come during the next decade.

The boy experimenting in an attic today may be an authority to-morrow. However, not even the cleverest inventors or experimenters always have the opportunity of making themselves known to the world, and it is right here that we are confronted with a mystery so far unsolved. Out of 100 per cent of young wireless experimenters, 90 per cent. are extremely bashful. Why this should be so is a mystery.

As stated before the new Wireless Association's sole aim is to further the interests of experimental wireless telegraphy and aerophony in this country.

Headed by America's foremost wireless men, it is not a money-making institution. There are no membership fees, and no contributions required to become a member.

There are two conditions only. Each member of the Association *must be an American citizen* and MUST OWN A WIRELESS STATION, either for sending or for receiving or both.

The Association furnishes a membership button as per our illustration. This button is sold at actual cost and will be mailed to each member on receipt or 15 cents (no stamps nor checks).

This button is made of bronze, triple silver-plated. The flashes from the wireless pole are laid in in hard red enamel, which makes the button quite distinctive. The button furthermore has the usual screw back making it easy to fasten to buttonhole. The lettering itself is laid in in black hard enamel. Size exactly as cut.

On account of the heavy plating it will last for years and is guaranteed not to wear "brassy."

Its diameter is 3/4 inch. This is a trifle larger than usual, the purpose being to show the button off so that it

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can be readily seen from a distance. The reason is obvious. Suppose you are a wireless experimenter and you live in a fairly large town. If you see a stranger with the Association button, you, of course, would not be backward talking to the wearer and in this manner become acquainted with those having a common object in mind, which is the successful development of "wireless."

The Association furthermore wishes to be of assistance to experimenters and inventors of wireless appliances and apparatus, if the owners are not capable to market or work out their inventions. Such information and advice will be given free.

Somebody suggested that Wireless Clubs should be formed in various towns, and while this idea is of course feasible in the larger towns, it is fallacious in smaller towns where at best only two or three wireless experimenters can be found.

Most experimenters would rather spend their money in maintaining and enlarging their wireless stations, instead of contributing fees to maintain clubs or meeting rooms, etc., etc.

The Board of Directors of this Association earnestly request every wireless experimenter and owner of a station to apply for membership in the Association by submitting his name, address, location, instruments used, etc., etc., to the business manager. There is no charge or fee whatever connected with this.

Each member will be recorded and all members will be classified by town and State.

After February 1st, 1909, members are at liberty to inquire from the Association if other wireless experimenters within their locality have registered. Such information will be furnished free if stamped return envelope is forwarded with inquiry.

To organize the Association as quickly as possible it is necessary that prospective members make their application *at once,* and without delay.

If you are eligible fill out application sheet and state particulars as follows: Full name; town; State; age; system and apparatus used; full description of aerial.

In order to facilitate quick clasification, please be brief and keep application sheet separate from your letter.

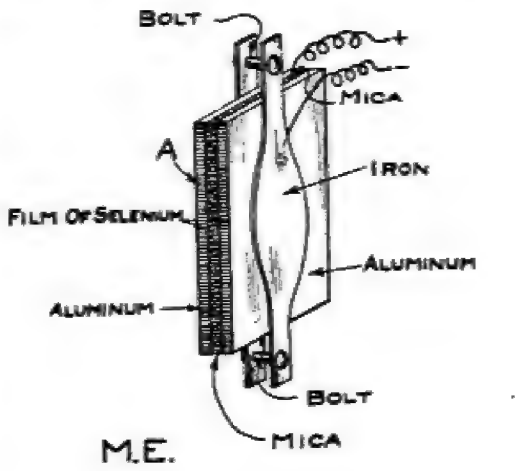
NEW SELENIUM CELL.

By our Paris correspondent.

Mr. G. M. Michin is the inventor of a new and very sensitive selenium cell, which will appeal to readers of MODERN ELECTRICS, as the construction is surprisingly simple.

Two plates of aluminum about one-eighth inch thick and two inches square are separated by an extremely thin film of mica (0.01 mm. thick), which must insulate the metal plates thoroughly from each other.

The plates are strongly pressed against each other by means of two flat pieces of iron and two bolts, as shown in illustration. Leading off wires are clamped between the iron



pieces and the plates, which insures perfect contact at all times. It is of course self-evident that the bolts must be insulated from the iron pieces, so as not to short-circuit the aluminum plates. This is best done by mica washers, or any other good insulator withstanding high temperature.

The cell should now be taken to a printing house or some other establishment owning a powerful paper cutter. About ¼ inch (on the long side of cell) should then be cut off carefully, so as to leave exposed perfect edges of the two aluminum plates and the mica separating them. It will not do to cut the cell by means of a saw, or by filing, only cutting by means of a sharp knife will make a good cell. Neither will the cutter be damaged in the least, as aluminum.

(Continued on Page 374)

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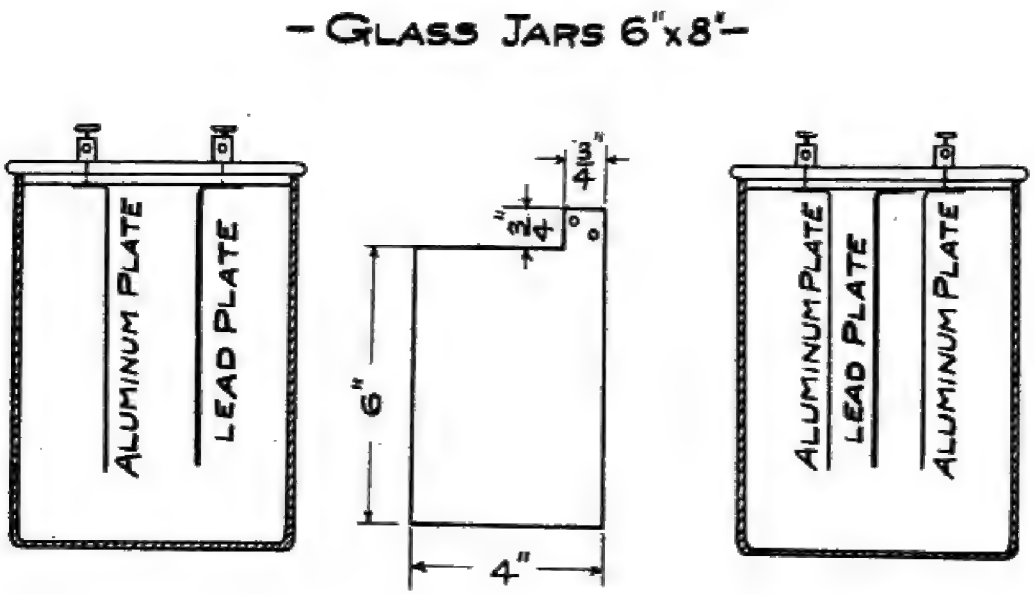
How to Make A Chemical Rectifier

By George P. French.



-Fig. 1- -Fig. 2.- -Fig. 3.-

Probably a good many readers of this magazine having access to alternating currents, want some cheap but efficient means of changing alternating current to direct current.

The cheapest apparatus is the chemical rectifier, which I will presently describe. Procure three glass jars, 6x8 inches; make a cover for each jar as shown in Fig. 1. The wooden covers should be boiled in paraffine wax to prevent leakage, although shellacking will do. Procure three pieces of 1/16 in. sheet lead 4x6 in. with a 3/4 in. lug in one corner (Fig. 2.). Also procure four pieces of sheet aluminum the same thickness and size as the lead plate. Fasten the plates to the cover by bending the lug at right angles to the plate and screwing them one inch apart. Two of the jars will have one aluminum and one lead plate as shown in Fig. 1. The middle jar will have one lead plate in the middle and two aluminum plates, one on each side of the lead plate, as shown in Fig. 3.

The solution is made by dissolving as much baking soda as the water will dissolve, thus making a saturated solution. Usually two or three handfuls of soda will be enough. Fill the jars within an inch of the top and lower the plates into them. Connect as shown in Fig. 4. It is advisable to put a lamp bank of six 110 volts 32- c. p. lamps on one side of the alternating current because if low resistance was put on the d. c. load it might burn out the wires.

The writer has used these rectifiers with three 32-c. p. lamps for charging storage batteries at a charging rate of 2 amperes.

The uses to which this rectifier can be put to are various, such as running small motors, spark coils, charging storage batteries, and lighting arc lamps.

A fresh solution should be made after the rectifier has run about forty hours.

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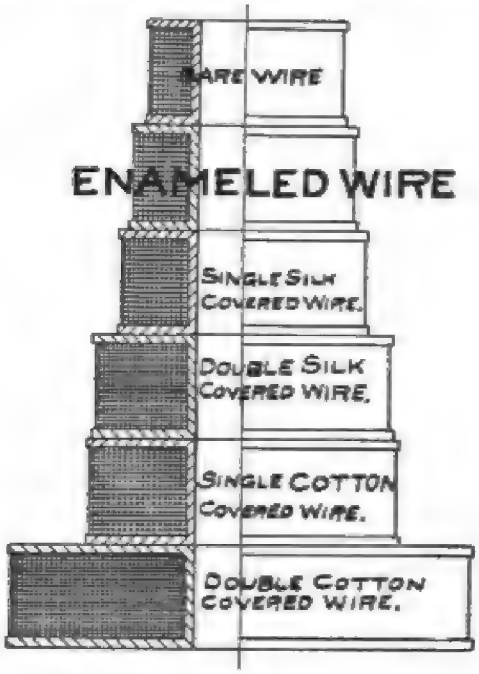
Enameled Wire

During the past year a new product has found its way in the electrical arts. It is the so-called enameled wire.

Several American and one German company manufacture this wire now, and on account of its great advantages, finds new friends every day. Our illustration, drawn to scale, explains better than words, why enameled wire is favored so much by manufacturers.

The compound used to enamel the new wire is a secret of the producers, and is guarded jealously. The enamel itself is of a brilliant black. It is very tenacious, and adheres to the wire in a truly remarkable manner. It does not chip off the wire, nor can the bare



M.E.

wire be exposed by repeatedly twisting same. The only way to bare the wire is by scratching off the enamel by means of a knife.

Heat does not affect the enamel to any extent, nor does cold affect it.

Enameled wire undoubtedly furnishes far more efficient apparatus when it comes to wind a certain amount of wire in a certain amount of space, as will be easily seen by studying our illustration. The electromagnetical efficiency of enameled wire wound apparatus is therefore very high.

In wireless instruments enameled wire found a stumbling-block, on account of the persons using it not being familiar with its characteristics.

This especially is the case with tuning coils wound with enameled wire. In fact, several untrained makers now denounce the wire as being worthless, as they had not the determination to go at the bottom of the matter, or to investigate the trouble.

The uninitiated winds the enameled wire tightly on a wooden drum and finishes the tuner. The coil is perfect, and works surprisingly well. A week later, however, the sad discovery is made that the entire wire is loose, as if it had been wound on a drum ¼ inch larger in diameter than the original drum.

They begin to think now that the wood has shrunk, and wind more coils on best seasoned, paraffine-boiled hard wood. Alas! a week later the wire is looser than ever, and they give it up in despair. The truth is, that the wire, wound under tension, "gives" or lengthens after a certain time, the same as a coiled spring will tend to uncoil or lengthen, *if the proper precautions are not taken.* Apparently the early makers of tuning coils and other similar apparatus did not stop to think of this simple phenomenon, and blamed it all on the wire.

There is only one way to keep enameled wire from uncoiling or stretching out, and that is, by fastening it to the object on which it is wound.

A New York house, building wireless apparatus, experimented with over 100 adhering substances for a period of eight months, and so far only one substance was found powerful enough to counteract the peculiar stretching property of enameled copper wire. This substance, it is said, will keep the wire tight forever; test coils wound with the new process four months ago and used every day, show no signs of becoming loose. The problem therefore seems solved.

The amateur thinking of winding his own coils is warned not to waste his time and money, but should rather buy the finished product, which will be much cheaper in the end. It is always safer to let the manufacturer experiment; to him it does not matter if 50

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coils are spoiled while experimenting, while if the amateur spoils one or two, it is a vastly different story.

HIGH SPEED PHOTOTELEGRAPHY.

Methods of sending photographs by telegraphy to distant points are now in practical use, one of the London newspapers having a daily photo-telegraphic service from Paris. In the existing systems, however, it takes half an hour or more to transmit an entire picture.

A scheme by which it will be possible to reduce this time to a few seconds has been proposed by two French inventors—Messrs. Senlecq and Tival. A photograph on bichromated gelatine is so impregnated with a metallic powder that the electrical conductivity of the surface varies precisely as the light and shade. When the photograph is moved about in an electric circuit the current accordingly varies, and when these variations are registered magnetically on a strip of steel, as in the "telegraphone," the steel may be said to contain a "magnetic picture" of the original. The use of the magnetized steel strip is the feature that determines the increased speed of transmission, for the strip may thus be run through the transmitting apparatus with any desired velocity.

In transmission the steel strip is used to reproduce in a suitable circuit the current variations that are registered on it, and these so move a screen of film, whose thickness is graduated from transparency to opacity, that the light that falls on the receiving sensitized surface is precisely of the same intensity as that corresponding to the particular point in the "magnetic picture" that is passing through the transmitting apparatus at that instant. The light passes through a hole in a rotating disc in such a way that it describes a spiral, finally tracing out the original photograph. This may all be done, it is asserted, in a few seconds. The observer's eye during this time would see on the sensitive plate a tiny spot of light moving in a spiral course, and increasing or decreasing in brilliancy as the particular point in the picture was to be light or dark.

If the time of transmission could be so greatly reduced that the whole spiral could be traversed in about one-tenth of a second instead of several seconds the course of the spot would become a continuous line of light, and the eye would behold the picture on the screen without the intervention of photography. This would, so far as the receipt of the image is concerned, be "seeing at a distance"—something often attempted, but never achieved. The object seen in this case, however, would be a photograph, not a natural object. It appears also that even the process in which the time of transmission is reduced to several seconds has not been worked practically.

ELECTRO MAGNETIC SOCKET.

The Electro Magnetic Socket is a self supporting device, which by means of magnetic attraction to iron or steel, will hold and support an incandescent

lamp in any position, allowing the light to be applied directly where desired. It can be used in any place or position where there is an iron or steel surface, holds the light firmly and can be applied at a moment's notice. Its utility and varied application suggests itself upon sight, and it can be used to advantage in boiler shops, machine shops, ship yards, safe shops, on structural iron work, iron vaults, etc.

At first glance the socket does not suggest its being constructed different from the ordinary kind, except that it is somewhat longer. The advantage of the device is that practically no extra current is used to energize the magnet, as the windings are in series with the lamp.

Only direct current can be used with this socket.

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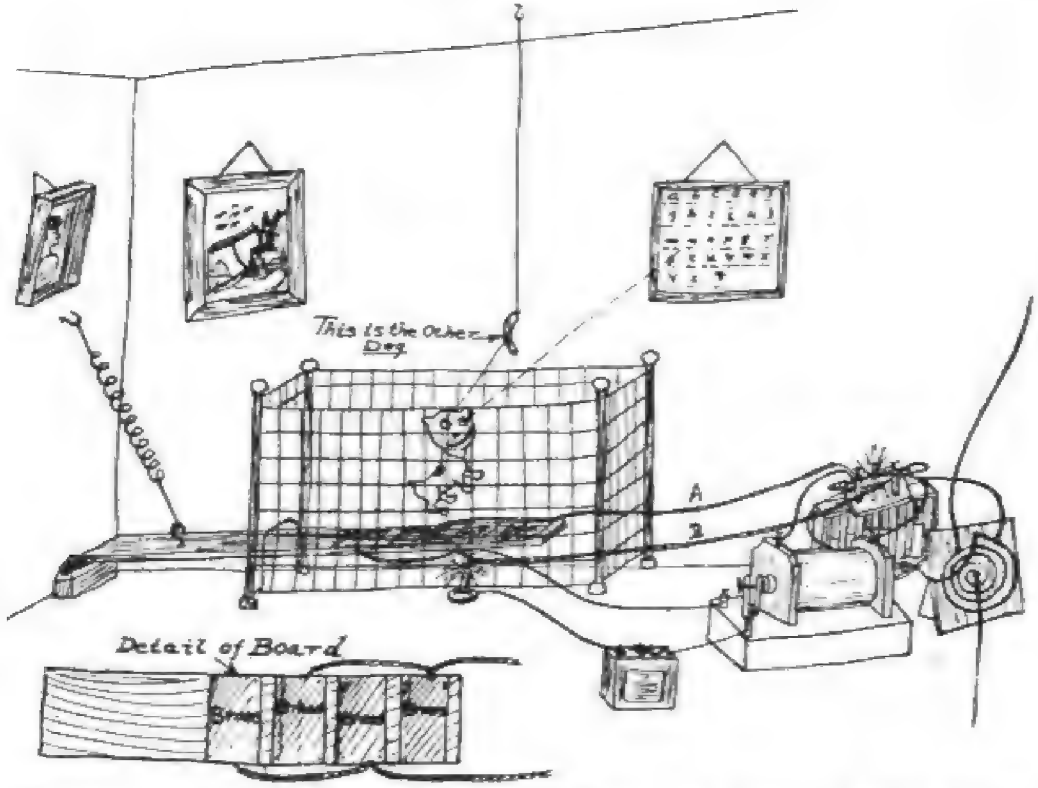
Automatic Wireless Transmitter

(Patent applied for.)

By "Fips."



Suppose you wish to test a new detector, or a new wireless "line." Heretofore it was necessary to have somebody at the key to send signals in regular intervals, as the ordinary human being cannot very well be at the key, and at the same time be at the detector, two blocks away from the key. Therefore your mother or your sister had to perform the tedious work of operating the key, while you were at the other end, busy testing.

Naturally this was not a very satisfactory method for several reasons. One reason is that your mother, while very likely quite a capable lady, cannot possibly work the key, keep the roast from burning, and darn socks all at the same time.

While I admit that your sister possibly has more time to spare, nobody, except yourself—at the distant end—could reproach her if she leaves the key in preference to her gentleman friend who called on her.

I hope that by presenting my marvelous automatic transmitter to the world, I shall earn the gratitude of all mothers and sisters having in their family a "wireless fiend."

Without wishing to be unduly immodest, I think that a nice bronze monument of myself in some public square is not asking too much, considering my invaluable services rendered on account of all the unburned roasts, my transmitter will save hereafter and the comfort all men will derive by wearing socks without holes.

A good automatic transmitter should, before all, send all the time, and my new apparatus does this surprisingly well. Several of the greatest scientific men of the world pronounced my transmitter a marvel, and the Chinese government has already ordered six complete sets.

By referring to illustration it becomes apparent that one of the requirements is a dog. (Do not use a cat, as same generates too much static electricity, especially when her claws short circuit your face.) A chubby, short, and rather alert little dog is the ideal one to use. A big, heavy dog is not to be recommended.

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Next get an ordinary wooden plank about four feet long and one foot wide. At one end of the plank a hinge is provided, as clearly shown in illustration. A strong spring is then attached to the board and the wall in order to keep the plank raised slightly, when not pressed down.

Under the right-hand side of board two contacts are provided, which are connected with the spark coil and battery in the usual manner. Every time the plank is pressed down the spark coil will operate. Next, a cage must be built around the plank, in such a manner that the latter can move freely, without, however, leaving enough space for the escape of the dog. The cage shown in illustration is a wire cage, but I use lately a narrow wooden box, tall enough so the dog cannot possibly jump out of it. It is of course understood that there shall be no room whatever between the sides of the box and the plank, as else the dog would simply walk from the plank, which he cannot do if the cage hugs the plank. with only about one-half inch clearance.

If we put Fido in his cage now and hang a fair sized sausage or soup bone immediately above the cage, but in such a manner that the dog, no matter how well he jumps, cannot reach it, he will for the next half hour unceasingly jump up and down in order to acquire the morsel. In the meanwhile he also operates the wireless set, by pressing the plank up and down alternately and in quick succession.

If, however, the dog is fairly clever, he will soon see through the whole business and become sick of it. He will then simply lay down on the plank and let the sausage strangle itself to death. In the meanwhile—the board being depressed, the coil will of course operate continuously.

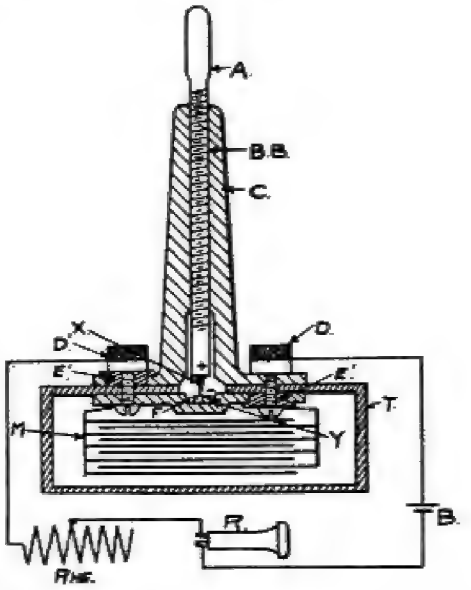
Naturally, this being a poor state of affairs, I immediately improved the apparatus. I arranged from eight to ten metal plates, about one foot wide, and about six inches long, over the entire length of the plank (but only inside of the cage), the plates being one inch apart. All the even plates are connected with a wire, the same being true of the odd ones. The two outleading cables are connected to the spark gap (see illustration).

(Continued on Page 373)

THE TELESCOPIC DETECTOR.

This detector consists of a brass plunger, A, with threads, BB, screwed into the brass tower on guide, C, which is mounted upon a brass base, and this in turn also mounted upon a hard-wood box, T. The plunger, A, has a knurled handle at the top, and at the lower end a piece of silicon ground to a fine and sharp point.

Underneath the point a cup, F, is provided. This cup contains a few drops of mercury. The binding posts, D and D' are connected, one with the cup and one to the tower. Inside the box is placed a certain capacity condenser, connected across the two binding posts.



M.E.

The two binding posts are insulated by the bushings, E and E'.

The detector is placed in series with a small battery Rheostat-regulator, a telephone receiver and a dry cell. The positive pole of battery is connected to the tower.

The good qualities of this detector are: It is dust proof, easily constructed, simple, compact, and above all, it is quite sensitive.

A film of oil may be placed over the mercury, if desired, to prevent its oxidizing.

The writer has a station of his own receiving over 500 miles. He uses the Telescopic detector and the microphone type, but the most dependable is the telescopic one.

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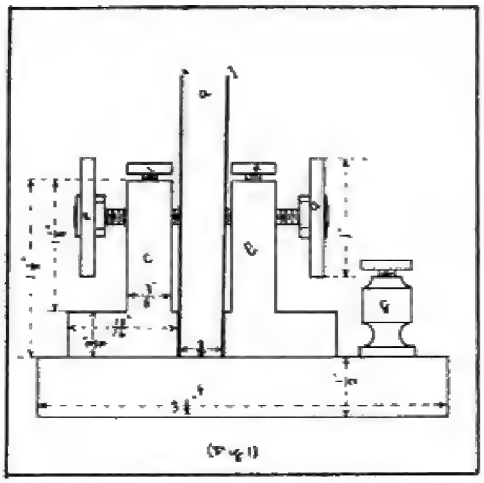
A Carborundum Detector

By S. W. Newsom.

A carborundum detector, when well built, is better for amateur use than the silicon detector because of its sensitiveness and reliability. As in the previous numbers of Modern Electrics no carborundum detector has been shown, the writer will endeavor to give a few pointers on the construction of this apparatus.



The most sensitive part of carborundum is the part between the crystals that resembles slag. The crystals are not quite so efficient.

The two brass standards (c and b, Fig. 1), and the hard rubber are about the only things that are not found in the amateur's work shop. The standards may be cast at any brass works and finished by the experimenter. If all metal parts are well nickeled the detector, in appearance, will repay the owner many times.

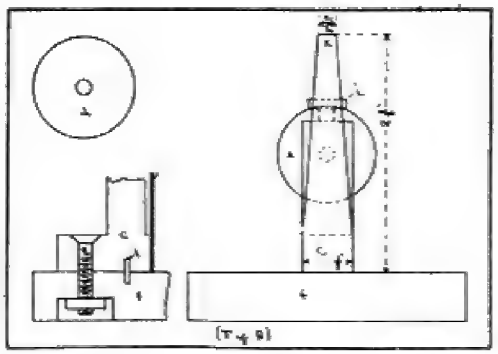
In the designing of the detector the aim was to produce an efficient serviceable instrument at as small a cost as possible. The materials required are: two brass standards (b and c), hard rubber base (f), four binding posts (g), two discs of hard rubber (d and e), two battery terminal screws, two thumb screws from old binding posts (h and i), two brass springs (j and k), and two brass bolts (2).

The standards are to be drilled and threaded, as shown in Fig. 1, for the adjustment screws (d and e), and the lock screws (h and i), 8-32 threads are to be used.

The standards (b and c) are to be bolted down to the base, with the brass bolts, as shown in Fig 2. The pin (1) Fig. 2, is made of a needle or a small wire nail. The hole for the pin is drilled into the standard and the pin is inserted; the hole in the base is then drilled in such a manner as to bring the standards 3/8 in. apart. While the standard is in the correct position mark the center of the countersunk hole for the brass bolt (2). Before bolting the standards to the base, the springs (j and k) are either soldered to (b and c) or fastened with two small screws. The holes in the bottom of the base to take the nuts of the bolts, and the screws for the binding posts, should be about 1/2 to 3/4 in. in diameter and 1/4 in. deep.

The connections are as follows: From bolt (2) of standard (c) make two grooves (about 1/4 in. deep and 1/16 in. wide) one to post 1 and one to post 4. From bolt (2) of standard (b) make two grooves (of the same size), one to post 2 and one to post 3. Connect the bolts to the binding posts and fill all the remaining space with hard wax. Binding posts (1 and 2) for the telephone receivers, and (3 and 4) are for the aerial and ground. A battery may be put in series with the telephone receivers, but it is not absolutely necessary.

To put detector in commission proceed as follows:



Select a carborundum crystal having (on one end) a very sharp edge. Good crystals have a pale pink or light color near the sharp edge. Clamp the crystal between k and j at a. The sharp edge of the crystal should be at right angles with one of the springs.

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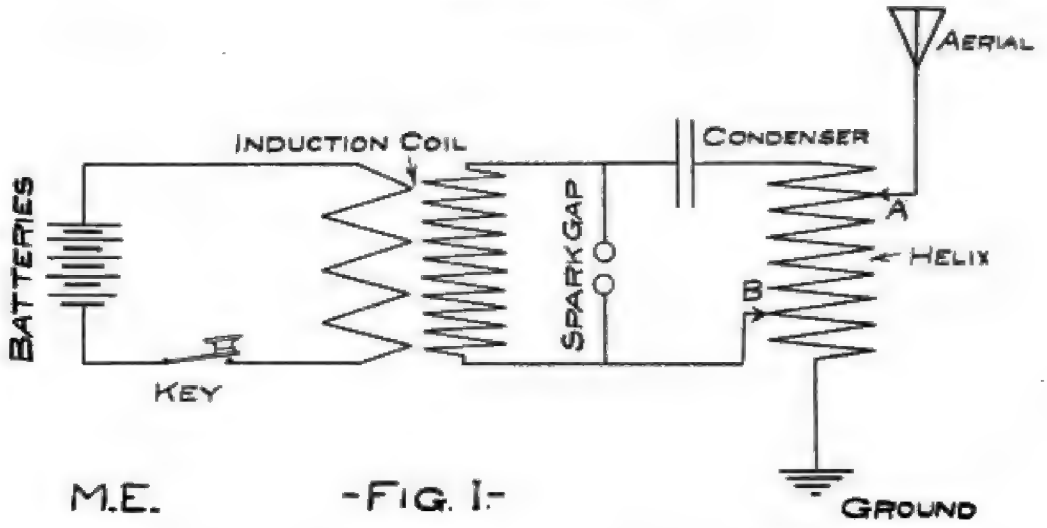
Wireless Troubles

Part II.

TESTING AND OPERATION OF TRANSMITTING INSTRUMENTS.

L. SPANGENBERG.



M.E. -FIG. 1-

As the article in the December issue pertained to receiving instruments, I will endeavor to point out a few minor troubles in connection with the Transmitting Instruments.

To use the tuned system you will need an induction coil of any size larger than one inch (of course, for inside work a one-quarter or one-half inch coil will do), sending Helix, condenser and spark gap.

There are several ways of connecting up the transmitting instruments, as in the case of the receiving instruments, but the writer gets the best results from the arrangement shown in Fig. 1.

It is the impression among the majority of amateurs that by putting a condenser in the circuit, either of the plate glass or Leyden jar type, it does not work as well on account of the reduced length of the spark, but one will notice it is far more intense and really of much greater efficiency, and by experimenting one will readily see that the transmitting instruments will work louder and over a much greater distance with the condenser in the circuit than without it.

To start with, the operator will get better results by working his coil at about three-quarters its full capacity, that is, not spreading his spark gap to a distance where the spark will not jump the instant the primary of the coil is closed, or even every time, but with a lagging. The condensers should be free from sparking, and also the Aerial switch, as every spark visible at any point other than the spark gap is so much energy wasted, except when using an anchor spark gap. In this manner the best results will be obtained from the transmitter.

The Aerial should be insulated more for transmitter than for receiver, and should not come closer than two feet to any metal objects, such as tin roofs and steam pipes, and farther away if possible.

If you have a friend who has a station, using the tuned system, with whom you wish to get in communication, assuming that your receiving instruments are adjusted properly, a time should be selected when both of you will be at the instruments, and but one of you test out at a time. For instance, if you wish to "get him," you call his "call" letters, in the meantime varying your inductance, both noting each variation, and in so doing you will both find readily the most efficient adjustment. Of course, the proper way to find this adjustment is by a hot wire meter, but this instrument being quite expensive, it does not come within reach of the majority of experimenters.

If you are not in touch with any station, and wish your transmitter to work as far as possible, a simple way of finding the adjustment is by taking the lead

(Continued on Page 374)

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Novel Detector

The detector shown in Fig. 1 is made of two Gillette razor blades mounted on

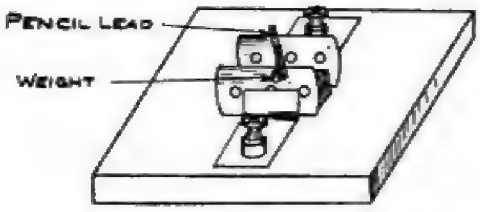

Fig. 1

an insulating base of paraffined wood, and held against a block of wood or hard rubber by two brass springs, to which the binding posts are connected.

A piece of pencil lead is laid across the blades. A piece of incandescant lamp filament with a small weight fastened to its center may be used instead.

Fig. 2 shows the connections of the detector. A telephone receiver and a dry cell are connected in series with the detector. One binding post of the detector is grounded and the antenna is connected to the other.

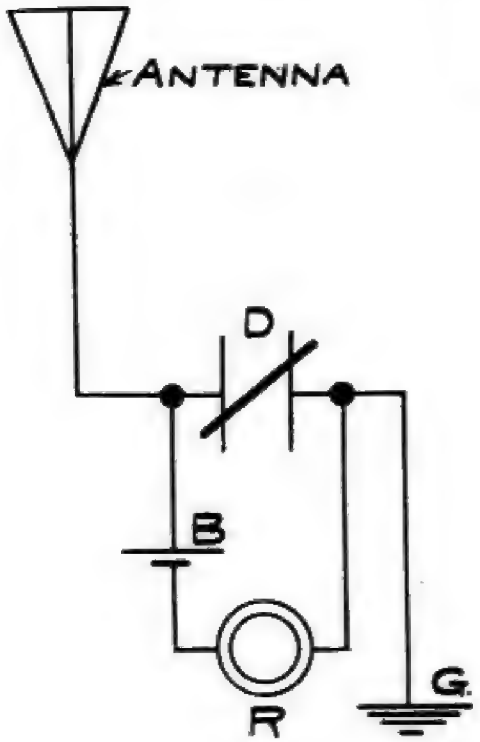

Fig. 2

This detector is copied after one in which carbon knife edges with a steel needle across them are used, but the steel blades with the carbon across seem to work just as good. It is hard to get a sharp edge on the carbon and the edge chips off very easy, so I thought I would reverse the combination.

The detector can be made more sensitive by using a potentiometer in connection with the battery and choke coils between the detector and the battery and receiver.

The sender I used with this apparatus consists of a gasoline engine wipe spark

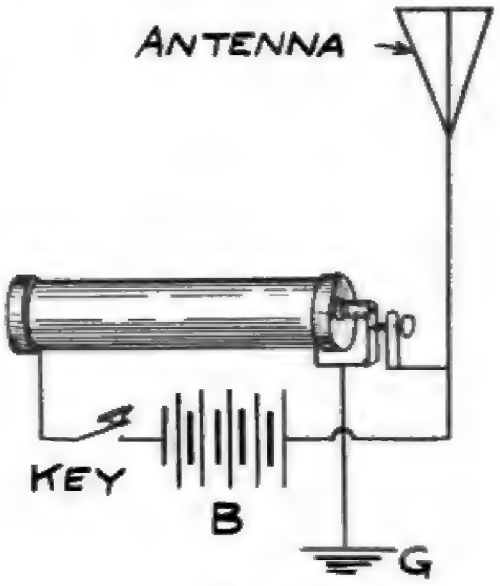

Fig. 3

coal with a vibrator, key and battery in series. One side of the vibrator is grounded and the other connected to the antenna. Fig 3 shows the connections of the sender.

It does not seem possible that the spark at the vibrator is strong enough to send out waves that could be detected, but I could hear it plainly in the receiver at a distance of one hundred yards with antennae twenty-five feet high.

The spark can be adjusted to its greatest strength by the contact screw of the vibrator.

Contributed by

CLARK PETTINGILL.

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HELPFUL HINTS FOR WIRELESS EXPERIMENTERS.

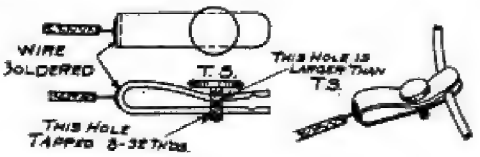
All metal parts exposed to corosion should be painted with black asphaltum varnish.

In making condensers for the transmitting circuit first loosen the dirt on the sheet glass by washing glass with a clean rag dipped in ammonia, then clean with scouring soap. The tin foil is smoothed out with a piece of chamois and is stuck to the glass with the aid of banana liquid. Smooth over the tin foil until it closely adheres to the glass, squeezing out the superfluous liquid. When dry trim the tinfoil with a sharp pen knife and clean off liquid on glass with rag dipped in diluted ammonia. Leave no sharp corners. When clean and dry the glass may be painted with black asphaltum varnish, making a neat appearance.

Zinc is the best metal for spark gaps. The standard size rods for spark gaps are 3/16 in. diameter.

The inductance coil in the transmitting circuit should have as little resistance as possible. If brass wire is used on account of appearances, no smaller size than No. 6 should be used; copper wire as small as No. 14 is sometimes used, but No. 10 or 12 is better.

By using an anchor gap the right amount of inductance can be easily determined.



M.E.

A very good clip used for making quick connection on the inductance coil is made from a piece of 1/16 in. spring brass, 2 1/2 in. long and 3/8 in. wide, and an 8-32 thumb screw. The accompanying sketch clearly shows the construction.

Contributed by

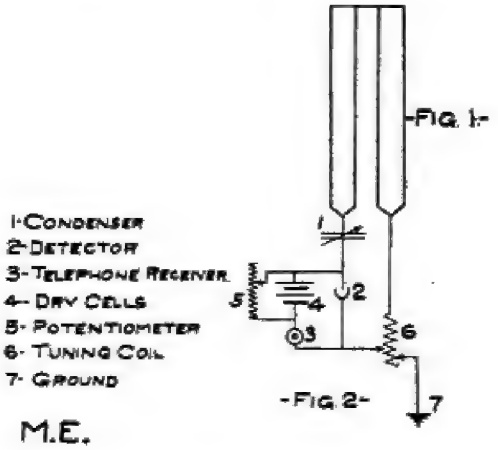
BENJAMIN ROUSLIN.

Discovered a new perfume. The greatest ever. Crush a piece of fused silicon and smell immediately after crushing. You will never crave for other perfumery once you smell crushed silicon. "Fips."

WIRELESS HINTS.

By PERCY E. PALMER.

In many of the directions for making electrolytic detectors, in contemporary publications, I notice that platinum (or Wollaston) wire about 0.001 in. in



M.E.

diameter is specified for the variable or movable electrode and much heavier wire of the same metal for the fixed electrode. While the above may give fairly good results over short distances, I find that to obtain distinct signals over long distances much finer wire *must* be used. The wire should be from 0.0001 in. to 0.0005 in. in diameter (Wollaston wire) having an outside coating of silver and a cup, made of very hard carbon, should be used for the other electrode and receptacle for the sulphuric or nitric acid solution, to get the best results.

Many amateurs, especially in cities, are greatly bothered by induction from light and power lines; so much so, in fact, that in some cases they can't receive from only very short distances. This induction may be almost entirely overcome by the use of a looped aerial connection. This aerial may be made as shown in Fig. 1, and the instruments connected as in Fig. 2. When using the usual "straightaway" aerial connection my receiving range was only about 100 miles, but by changing to the looped aerial connection shown in the figure I have heard several times stations about 1,000 miles away. The connection is equally good for silicon and electrolytic detectors. In the case of the former, however, the battery and potentiometer should be left out.

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Wireless Department

Aerophone Tests Before British Admiralty

By Dr. Lee de Forest.

As several misleading statements have been made of late regarding the author's tests with "Radio Telephone" apparatus, before the British Admiralty last September, the writer presents below an authentic list of the results obtained.

The Admiralty required only a one-way test, hence only one transmitting, and one receiving apparatus was used.

The "Vernon" training ship, stationary in Portsmouth Harbor, was receiving. The following notes were taken, partly by the officers in charge of the tests, and partly by Mrs. de Forest.

The transmitter was installed on the "Furious," which started from Portsmouth at 9.30 a. m. and steamed out into the Channel to the east of the Isle of Wight, reaching its maximum distance of 50 knots at about 4.30 p. m. The author transmitted and kept a record of all messages sent, official and otherwise. The test numbers sent were read for the most part from the American stock quotations of the *Daily Mail* for September 28th.

The following report gives a general idea of the accuracy of transmission.

The telephone was used for every alternate fifteen minutes from 9.30 a. m. to mid-day; from 1 p. m. to 5.30, and from 7 to 9.30. Throughout this time the telephonic communication was perfect except for a short period during the afternoon when loud tuning right in Portsmouth Harbor rendered receiving very difficult. For all ordinary interference, due to Morse signalling, the voice can be heard and understood through the dots and dashes.

In this respect, working through interference, the Aerophone is demonstrated as much superior to the telegraph. Such a percentage of accuracy as that of only two errors out of 154 figures at a distance of 50 miles, through severe interference, would have been absolutely impossible by means of the wireless telegraph of equal power.

Many official messages were read and correctly received, but these cannot, unfortunately, be embodied in this report.

It was found that the Perikon detector could be used up to 30 sea miles, but it was as faint at that distance as the Audion at 50 miles. This test gives a fairly accurate idea of the comparative sensitiveness of the two receivers.

50 knots. 60 English miles. 90. km.

H. M. S. "Furious" to "Vernon"—Portsmouth, September 28, 1908.

Distance—16 Knots:

1271316	.....
7612	7612
45916	45916
8978	8978
97516	97516
9918	9918
88516	88516
17714	17714
20238	20238
4138	4138
1041316	1041316
13	13
10416	10416
137316	137316
2734	2734

(Each number read twice.)

Received on "Vernon":

"Guantanamo, Colon, Venezuela, Honduras," (Splen-did). "Sighted enemy, bearing N. N. E. Steaming south 14 knots. Single line ahead."

Distance—17 Knots:

"Five armoured cruisers, 10 cables on port beam, one has been detached to chase me, am closing." Repeated.

(This was read through bad interference).

Distance—25 Knots:

Received on "Vernon."

"Repeat all signals between Admiral and Forsythe. (On *spelling out* this was read Foursight). If unable to comply show a fall (later spelled out 'flag') at masthead."

Distance—27 or 28 Knots:

"Indicate the name of the officer of the first watch."

"You are appointed for service in attendance. Please keep steam up and be ready to proceed at a moment's notice."

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(All of these messages read through bad interference caused by Morse signals near by.)

"There will be an examination of candidates for the rank of Lieutenant on board H. M. S. 'Dreadnought'."

Distance—44 Knots:

12112	12112	.....
74	74	.....
4438	4438	.....
8734	8734	.....
95	95	.....
9714	9714	.....
86	86	.....
17214	17214	.....
198	198	.....
4034	3045	4034

On second reading this was read correctly.

10214	10214	.....
13514	13514	.....
2714	2714	.....
65	.....*	.....*
30	31	.....
4314	4314	.....
7212	7212	.....
130	130	.....
105	105	.....
31	31	.....
8412	8412	.....
5312	5312	.....
10334	10334	.....
4014	4014	.....
72	72	.....
8978	8978	.....
12218	12218	.....
12918	12918	.....
9934	9934	.....
10334	10334	.....
2118	2118	.....

* Door of booth was opened here.

In this list there were two figures read wrongly in a total of 154.

Distance—45 Knots:

"Hello—This is No. 2 Microphone. Reading is 8 1/2 to 7 1/4. Will cut down reading and see if you can get me any better. I cut down one and increased capacity. How much further can you hear?"

(Bad interference.)

Distance—50 Knots:

"Fifty miles. Must turn back now. Wait a minute, 'Vernon'."

Capt. Jones.—"Dr. de Forest is fully satisfied. Do you wish us to go further?"

Distance—50 Knots:

"We are now going in, full speed. At 7 o'clock we will call you by 'phone.

"At 7.30 we will then be 20 miles away."

(Recorded by Lieut. Cooke.)

121 1/2	121 1/2	....
74 1/2	74 1/2	....
4438	4438	.....
8712	8712	.....
9434	9434	.....
9612	9612	.....
8686	8686	.....
17212	17212	.....
197	197	.....
4014	4014	.....
102	102	.....

"No. 1 Microphone, reading 8. Now No. 2. Say which is best. Will call you at 7, 7.30 and 8."

The very gratifying accuracy shown in this official test demonstrates unequivocally that the Aerophone is destined in time to replace flag-signaling on shipboard, and to extend the range of such present code signaling up to 50 and 100 miles; and through night and weather which now makes flag signaling impossible even over the shortest distances.

(Note:—Throughout a large part of this test the wireless telegraph interference at the "Vernon" was very severe. When the above messages were being read from a distance of 50 knots condensers were being tested right on board the "Vernon," using a large spark.)

CARBORUNDUM.

Probably few readers of MODERN ELECTRICS know how the carborundum crystals with which they frequently experiment as wave detectors are made. Considering the comparatively simple materials from which these crystals are made it is really wonderful that such a hard substance as experimenters know carborundum to be, may be made from them.

When I say that they are salt, coke, sand and sawdust, you will no doubt be surprised. But the wonder lies in the enormous amount of heat used to make them. It is only the powerful electric current generated at Niagara Falls, N. Y., that can produce heat enough to fuse these everyday materials into the crystals which amateurs now use as Hertzian wave detectors. A temperature of seven thousand degrees Fahrenheit is maintained in an electric arc furnace and in this heat the raw materials are converted into hard crystals which beside their value in wireless telegraphy are used commercially as an abrasive. In the latter case it is crushed and ground and then made into grindstones, oilstones, and the like.

Contributed by LEWIS W. KLOPFER.

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Modern Wireless Instruments

Fig. 1

VARIOMETER.

Modern receiving instruments, especially those used commercially, have an important object in view, that is, to allow as little of the receiving energy as possible to go to waste.

The Variometer is such an instrument. It differs from a one slide tuning coil, as it has no so-called "dead" or open ends.

In order to adjust the inductance of the antennae the general procedure is to connect to the latter coils, provided with plugs, or, as is found more generally, coils with sliding contacts. To provide a greater amount of inductance we often find several coils connected in series and placed in the antennae circuit.

However, this method is not very efficient, as the received oscillations are still affected by the "dead" or open ends of the coils, or else are forced to pass through the unused coils, which of course does not give maximum efficiency to the circuits.

In order to minimize above defects, Variometers are coming into use now. These instruments consist of two coils wound on spherical surfaces, one placed inside the other, capable of being rotated and separated from the outer by a thin sheet of hard rubber. Fig. 1.

The Berlin firm of Lorenz & Co. has found this construction ideal, not only from the mechanical but from the electrical standpoint.

Fig. 1 shows a view of the Variometer coils with housing removed. The body of the fixed outer coil is attached to a hard rubber plate from which the knob serving to turn the inside spool, the index arm, and the tightening arrangement (set-screw), project. The pointer passes over a scale having

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equally spaced subdivisions and which is readable from 0° to 180° Any attempt to go beyond these two limits is prevented by stops placed inside the

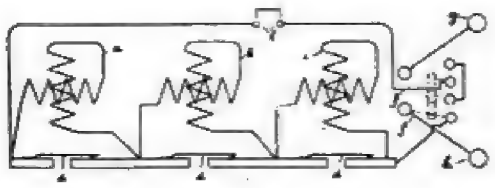

Fig. 3

Variometer case. On the hard rubber cover are furthermore provided two binding-posts, which are connected to the Variometer coils by means of two exceedingly flexible wires enclosed in soft rubber tubing. Between these posts a switch is placed which connects the Variometer in a manner indicated, or else automatically short-circuits it. In the latter case no current flows through the instrument.

The wire conductors themselves are designed very carefully. Each conductor cable is made by a peculiar process, fully protected, so that each strand lies on the outside of the cable equally with every other strand. The skin resistance for high frequency currents is absolutely the minimum possible. The complete conductor thus made is silk covered, and wound upon ebonite spools with the utmost exactness.

The outer casing is usually made of polished wood or hard rubber lined with zinc, or of nickeled metal, and which is locked to the hard rubber cover carrying the connection posts and reading scale.

The dimensions of a large Variometer are about 12¼ x 9 x 10 inches. The weight of the instrument is approximately 13 1/3 lbs.

The set-screw is purposely provided so as to lock the pointer after it is once set to the value of self-induction desired.

In the triple Variometer, Fig. 2, three instruments are incorporated. This combination takes the place of three ordinary coils connected in series as explained above.

The three Variometers are connected in series, and are placed behind each other. The inductance of each Variometer is of course different than that of the others. Thus the first may cover a range from 330 to 3,300 centimeters, the second from 3,000 to 30,000 centimeters, and the third from 29,000 to 290,000 centimeters.

The adjustment of the triple Variometer is similar to the one of the single Variometer described above, except that it possesses a short-circuiting arrangement, which is automatically brought into action as soon as the zero position is reached.

Thus the short-circuiting arrangement cuts out entirely the unused Variometers, which of course prevents any possible loss of energy.

Fig. 2

Fig. 3 shows the scheme of connecting the triple Variometer combined in one case. "a," "b" and "c" are the separate Variometers whose shafts are respectively connected with the short-

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circuiting switches "d," which are closed as the turning handles reach a fixed point. At a point in the conductor joining the series-connected Variometers is an opening "e," which

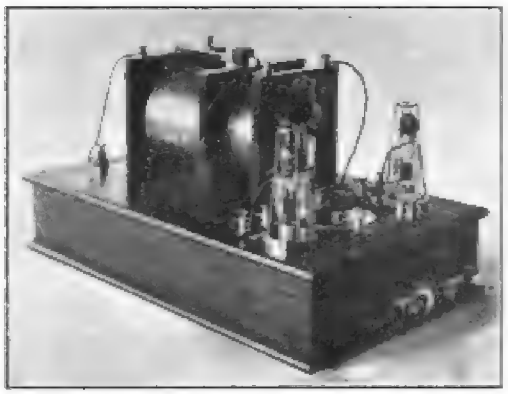

Fig. 4

can be closed either by a switch or by connecting to it an additional inductance. In this way a still greater range can be had than by connecting together simply the Variometers themselves. Furthermore, a switch "f" is provided, making it possible either to connect the apparatus between the antenna and the earth (or counterpoise) binding posts "g" and "h," or to directly short-circuit the posts, in which case the antenna system is directly connected to the tuner system.

SYNTONIZER.

Illustration Fig. 4 shows a combination syntonizer and receiver, such as is used now in wireless telegraphy and aerophony.

The tuner comprises primary and secondary coils, both provided with variable contact slides, which allow to vary self induction and mutual inductance.

On top of the case are shown two Audions of the "Grid' type, and also (on the side of the base) a Perikon detector.

The Audion is especially valuable in long distance work, as it introduces less damping into the oscillating receiving circuit than a good many other detectors. The action is not rectifying, but it is based on a relay effect. The response is strictly quantitative, following faithfully the variations in intensity of the received oscillations. An adjustable rheostat for regulating the lighting circuit is provided. (Rheostat knob of hard rubber is seen between the two Audions).

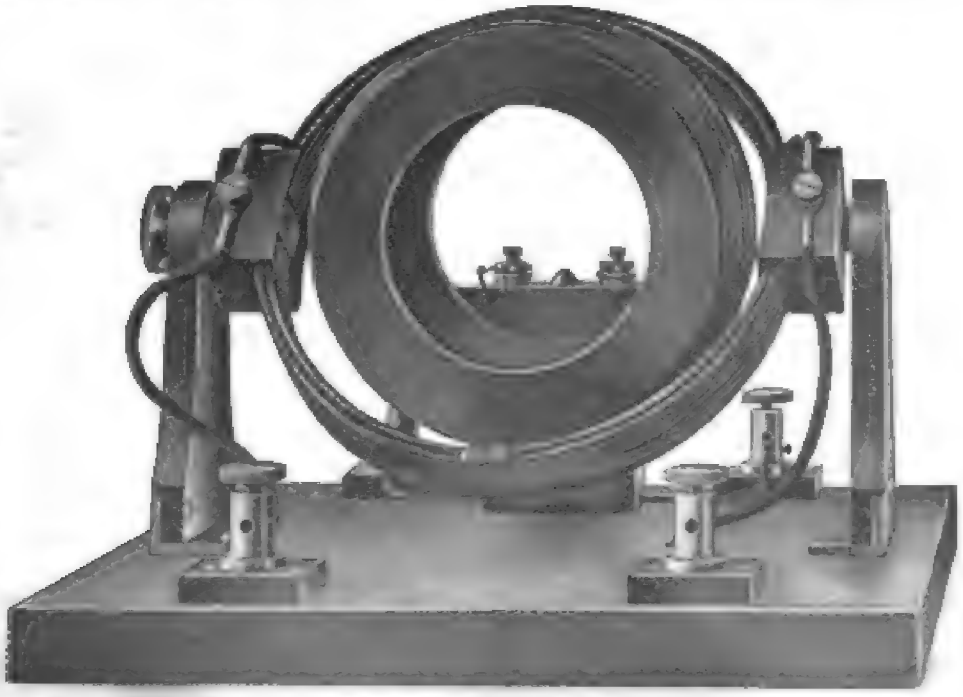

Fig. 5

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To safeguard the very delicate audions from shocks, etc., they are now housed in a sort of rigid wire cage which gives the instruments a somewhat odd appearance.

LOOSE COUPLER.

In order to obtain maximum sharpness of tuning loose coupling between oscillating and receiving circuits is of utmost importance. Hitherto it has been the prevailing custom to merely separate the two coils, a method which of course, is very crude. With powerful and slightly damped received impulses, this separation is frequently required to be so large as to be impractical.

Fig. 6

In Fig. 5 is shown a loose coupling apparatus to obviate above difficulties. It also permits of a coupling which is theoretically infinitely loose—something not accomplished by great separation nor by merely turning the axes of two coils at right angles to one another.

The inner spherical coil, shown in the illustration, is made up of several layers of wire on a spherical ebonite drum, wound in a peculiar fashion to bring each wire to the surface equally.

This inner coil can instantly be removed and replaced by another, having a different inductance value.

On account of the design of this coil the air gap between the fixed inner and the rotating outer coil is very small. The outer coil can be changed in any position and may be used either as primary or secondary of the oscillation transformer, as desired.

AERIAL SWITCH.

Fig. 6 shows an up-to-date aerial switch. Connections are so made that when the arm is in vertical position antenna is connected to the tuner and the power circuit supplying motor or motor-generator is open, thus making it impossible to send with tuner connected in circuit. When arm is in horizontal position antenna connections are broken and the power circuit supplying motor-generator is completed. The switch shown, while giving ample insulation and mechanical strength, is much smaller and lighter than others designed for the same purpose and better adapted to the work.

THERMOELECTRIC DETECTORS.

C. Tissot, to the recent criticism of E. Branly, points out that tellurium detectors work without a battery, and are, therefore, not based upon a mere coherer effect. When they are connected with the antenna in parallel with a galvanometer, the galvanometer shows a deflection when waves impinge upon the system. The latter would hardly produce the undirectional effect described if the detector simply operated by a variation of the closeness of the contact. Another characteristic difference is that the thermoelectric detectors respond, not in accordance with the amplitude of the variation of potential, but in accordance with the mean energy impinging upon the system. This may be proved by measuring the energy with a bolometer, an instrument by means of which detectors may be tested quantitatively. Good results are also obtained with other substances occupying extreme positions in the thermoelectric series, notably with fused sulphide of copper, and its natural variety (chalcosine), as well as Becquerel's alloy, containing 10 parts bismuth and 1 antimony. The thermoelectric de-

(Continued on Page 374)

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Wireless Telegraph Contest

Our Wireless Station and our Laboratory Contest will be continued every month until further notice. The best photograph for each contest is awarded a monthly prize of Three ($3) Dollars. If you have a good, clear photograph send it at once; you are doing yourself an injustice if you don't. If you have a wireless station or a laboratory (no matter how small) have a photograph taken of it by all means. Photographs not used will be returned in 30 days.

This competition is open freely to all who may desire to compete, without charge or consideration of any kind. Prospective contestants need not be subscribers for (the publication) in order to be entitled to compete for the prizes offered.

FIRST PRIZE, THREE DOLLARS

I am sending you herewith photographs of my wireless station.

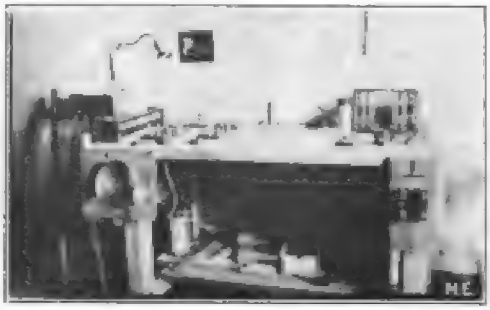

Fig. 1 shows my complete apparatus. To the right is a spark gap and on a shelf underneath it is a 2-inch coil (not

seen in the picture), operated by either storage or dry batteries. The rest of the apparatus is an adjustable condenser and two sending keys, one is used for speed. In the middle of the table is a double pole throw switch. To the left is my receiving apparatus, which consists of a non-inductive potentiometer, a coherer, relay and decoherer, also a tuning coil, an autocoherer, electro-lytic detector, telephone receiver and headband with necessary switches and batteries.

By means of potentiometer, tuning coil, electro-lytic detector, condenser and telephone receiver, I can hear any commercial station within 200 miles.

Fig. 2 shows my aerial with which I get excellent results. It consists of six bare copper wires suspended from a twenty-five foot pole. The wires are fifty feet in length, and extend down to an extension on the third floor. My operating rom is on the fourth floor.

MODERN ELECTRICS is the leading magazine on electricity, especially wireless.

New York. ERNEST AMY.

HONORABLE MENTION.

Enclosed herewith please find a photograph of my amateur wireless station, constructed by myself with the exception of the head phones, induction coil and two knife switches.

The top of the pole supporting my aerial is exactly 100 feet above ground. After experimenting in a practical way with the various forms of aerials I have adopted, as giving the best results, one consisting of two d.c.c. copper wires hung practically parallel to the magnetic meridian, each two hundred feet long. They are connected with each other at the center only and from this point two lead-in wires are taken (of the same size wire), each 175 feet long. I use this aerial in connection with the Shoemaker receiving circuit and De Forest sending system.

Referring to the photograph, at the left of the table is a large box containing the tuning coils, 800 ohm potentiometer (in 1/2 ohm steps), variable condenser and the necessary connections. The detector on top of this box is of the

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electrolytic type. A glass jar contains the dilute nitric acid and a lead pencil graphite is used for the larger contact. The delicate Wollaston wire is adjusted into the acid in the usual manner by means of the large adjusting screw.

A carborundum detector is mounted on the smaller box to the right of the large one. The head phones are of the well-known 3,000 ohm type and are especially efficient for long distance work. The aerial switch just under the table top is placed there temporarily only. The E. I. Co.'s 2-in. spark coil is at the back of the table next to the sending inductance. I run this coil in series with another one of the same size (purchased since the photograph was taken) on a 220 volt lighting circuit, with an electrolytic interrupter, which is placed in a battery jar.

The spark occurs between two battery zincs on top of the sending inductance. In back of the spark gap is a hot wire ammeter reconstructed from a battery ammeter.

The home made telegraph key has contacts made of battery screws which are very easily renewed. They are quite as efficient as platinum unless very fast sending is done.

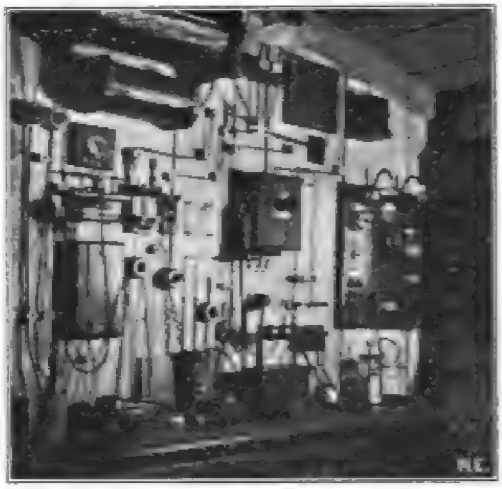
With this outfit I am able to hear all of the Pacific Coast stations and ships between Tatoosh Island, at the head of Puget Sound, and Magdalena Bay in Lower California. I am able to send up to several miles and to send further

it is merely a question of making a larger coil. I commenced experimenting with wireless a little over a year ago, and MODERN ELECTRICS has given me many valuable suggestions.

California. S. A. VINCENT.

HONORABLE MENTION.

Enclosed please find a photo of my wireless station and laboratory. The station is used for telegraphy or telephony. The transmitting apparatus at the right consists of a 2-inch spark coil, a strap key, one battery switch, one point switch, a sending helix spark gap variable condenser, one telephone, one snap switch, one 110-volt eight c. p. lamp, and one Leyden jar connected across



the spark balls. At the left the receiving apparatus consists of two tuning coils, of which one is wound for 150 meters and the other for 200 meters, which gives 350 wave length. Each detector has its own tuning coil. The auto-coherer is made of 2 1/2 inch long glass tube, and diameter of the hole is 1/4 inch with one carbon and iron plug and a drop of mercury between. It is used with a 150-ohm telephone receiver and a 10-ohm rheostat regulator. On the table at the left is a decoherer, a nickel filing coherer and a 1,000 ohm relay; one electrolytic detector and one silicon detector; one battery for the relay and one for the auto coherer. The electrolytic detector and silicon detector have one single-throw double pole and 2,000 ohm head receiver. I use dry batteries now, but I will have the apparatus working on a 150 watts dynamo. At the right is a switch board which consists of two switches, one for a. c. and the other for d. c. current; one battery regulator; one K. W. transformer; one a. c. ringer; one buzzer; one volt and amp. meters; at the bottom between the two switches is a plug board. The storage battery apparatus is under the bench. My aerial is 50 feet high with 6 ft. spreaders. I have been taking your magazine from the beginning and found that it is the best magazine that I ever had. G. A. KOTCHEE, Ill.

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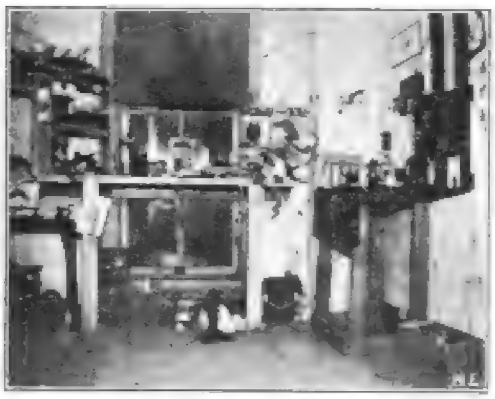
Laboratory Contest

FIRST PRIZE, THREE DOLLARS

Enclosed find picture of my shop and wireless station. On the left is my lathe, tools and supplies. On the right is (first) my switch-board for motors,



lamps, etc. Next is part of my wireless. The rate of my coil is one-inch. My wave length is 50 meters. I have had very good results from my station. The nearest commercial station is about 2 miles distant. I would like to add also that MODERN ELECTRICS is a *great* paper. Some day when I get a large camera I will send you a picture of my whole shop, which is fifteen feet square. BEN ORR, Texas.

HONORABLE MENTION.

I inclose two views of my laboratory. The shop was made by myself and I built it 12x18 feet, so as to have plenty of room for my experiments. One view

is of myself seated at the table reading MODERN ELECTRICS, with some few of my instruments near me. The motor just in front of me was made from an old brake wheel on freight car, the same as numerous other apparatus which I constructed from old material.

I have built several dynamos, motors, and gasoline engines, yet not toys, because I incorporate the same principles in a small model as I would in a large one.

The other view is of my plant. The engine was sold for scrap iron and I bought it for almost nothing. I now have it in perfect running order. The dynamo was picked up in an old junk pile. I promptly re-wound and repaired it, and it is working now to perfection. The switchboard was made from an old soda water counter. I constructed all the instruments on it except the voltmeter.

I have also an experimental wireless telegraph station, with which I can receive messages 300 miles; I have no picture of it now, but will send it in with a description of same shortly.

I never have had a technical training, but have learned what I know about it here at home; I am 18 years old.

Georgia. CARL CHUPP.

ALUMINUM FOIL

in place of the heavy tin foil is something new in Wireless. It can now be had as thin as one thousandth of an inch thick.

It is very strong, does not tear easily, and has good conductivity. Used in Leyden jars, it does not blister. Even a large condenser made of aluminum foil is ridiculously light. It is really cheaper than tin foil, although its price per pound is several times that of tinfoil. However, one pound of aluminum foil will cover a surface eight times as large as that covered by a pound of tinfoil.

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WALKING WIRELESS STATION.

Our illustration shows what is very likely the first walking wireless station in existence. It was used during the holidays by an enterprising New York firm who manufacture wireless apparatus and outfits, catering especially to experimenters.

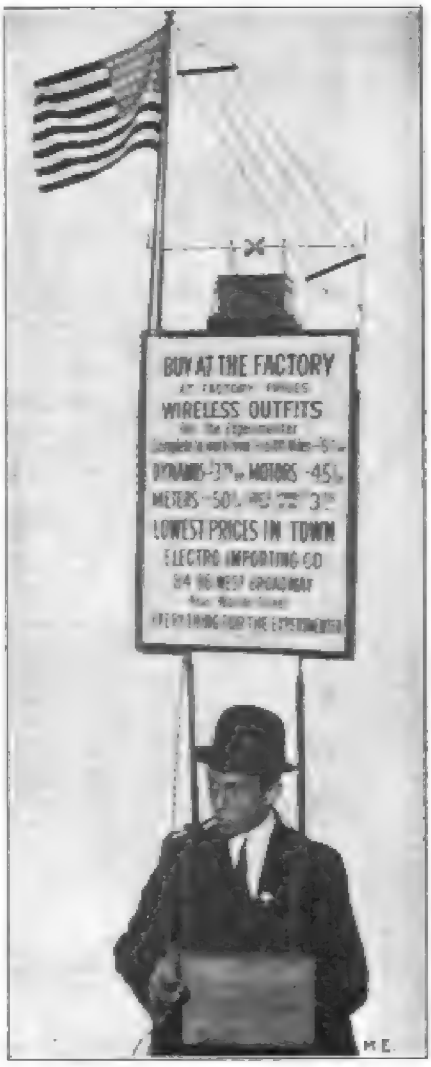
To make an impression on the holiday buyers, the man carrying the combined sign and wireless station, walked in the busiest streets, operating all the while the small half-inch spark coil, by means of a button carried in the pocket. Four dry cells were used to energize the coil, while the cells themselves were carried in an oblong box, hung from the side of the carrier in manner of a knapsack.

Zinc spark balls, sending condenser, and four wire aerial three feet tall, were used, and it was surprising that the noise produced by the spark was so strong and piercing that it could be heard very plainly for two blocks on Broadway during the busiest hours, notwithstanding trolley cars, automobiles, and heavy wagons, which

usually drown almost any kind of noise.

The effect on the crowds was amusing. The sign invariably stopped the busiest man as soon as the sharp crashing noise of the spark was heard.

As long as the sign remained on the streets it was continually surrounded by people, those nearest to the carrier asking for information.



The man carrying the sign never dared stand still, as invariably hundreds surrounded him, and frequently the police had to disperse the crowds which blocked the street.

Undoubtedly the American public commences to take a lively interest in everything that is connected with wireless.

WIRELESS AROUND THE WORLD.

(Continued from Page 339)

and at the same time with much greater certainty. This modernization step is acclaimed by our great naval benefactors as proper and quite fitting to a nation of "Peace and War."

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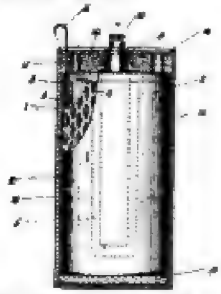
Electrical Patents for the Month

906,862. GALVANIC CELL. Joseph T. Ellis, London, England. Filed Sept. 23, 1907. Serial No. 393,248.

1. A battery of the character described comprising an expanded sheet metal electrode



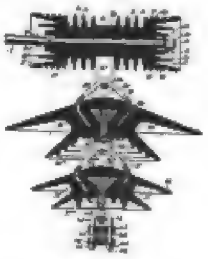
2. A battery of the character described, comprising an outer metal casing and a layer of expanded sheet metal disposed adjacent thereto and in electrical communication therewith, said casing and expanded metal comprising one electrode of said battery, substantially as described.

906,781. TELEPHONE-RECEIVER. Nathaniel Baldwin, Heber, Utah, assignor of one-half to William Will, Heber, Utah. Filed Jan. 29, 1908. Serial No. 413,726.

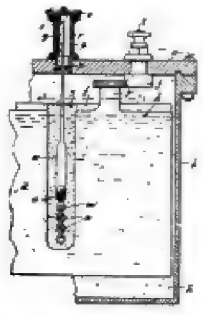
1. A magneto telephone having a permanent magnet, an armature in operative relation thereto, means for causing both poles of the magnet to act on each side of the armature, and means for producing opposite effects in the same pole piece.

906,014. FLEXIBLE SUSPENSION FOR CONDUCTORS. Louis Steinmetz, New York, N. Y. Filed Sept. 23, 1907. Serial No. 394,111.

1. A flexible suspension for conductors, comprising a sleeve provided at its ends with annular collars extending in the general length of said sleeves, and annular air spaces intermediate said collars for the purpose of maintaining dryness in said air spaces, means for supporting said sleeve, and mechanism connected with said sleeve for supporting a conductor



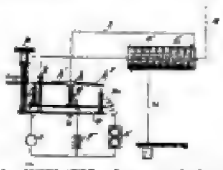
907,487. STORAGE-BATTERY ATTACHMENT. Richard J. Fleischer, Milwaukee, Wis. Filed July 5, 1907. Serial No. 382,309.



1. A storage-battery, a weighted hydrometer partly immersed in the liquid contents of the battery, a scale of this hydrometer being projected through an opening in the battery-cover, a transparent gage-shell fitted in said battery-cover opening to inclose the upper portion of the hydrometer-stem, and a chain attached to the lower bulb-end of the hydrometer, the chain being collapsed when said hydrometer is full down in the electrolyte of said battery

906,537. RECEIVER ARRANGEMENT FOR WIRELESS TELEGRAPHY. Gerhard Zehn, Berlin, Germany. Filed June 12, 1907. Serial No. 378,535.

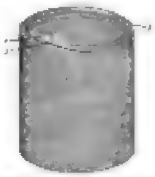
1. Receiving means for wireless telegraphy comprising in conjunction a coil of wire, a receiving device, terminals therefor, an inductive winding through said coil, connected with one terminal of said receiving device, a conductor connecting that end of said coil at which said currents enters into the mains with the other terminal of said receiving device and a condenser connecting the other end of said coil to earth.



906,141. INSULATOR. Lawrence L. Boyle, East Orwell, Ohio. Filed May 28, 1907. Serial No. 376,079.

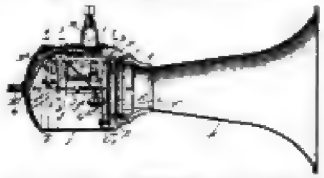
An insulator comprising an elongated body substantially in cross section and having rounded ends, the body having continuous U shaped grooves formed therein intersecting at the rounded ends of the body, one of the grooves being of a greater depth at one of the rounded ends of the body and the other groove being of greater depth at the other rounded end of the body, a wire looped around the body and engaged in one of the grooves, the wire having portions twisted together at a point of intersection of the grooves at one end of the body, in combination with a supporting wire looped around the body and engaged in the other of said grooves, the wire having portions outwardly of the end of the body twisted to form an elongated strengthening portion, the last named wire having free engaging portions outwardly of the twisted ends.

906,584. INSULATED CONDUCTOR. Joseph I. Mitchell, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York. Filed Sept. 14, 1903. Serial No. 173,047.



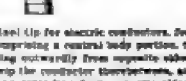
A conductor adapted for use in making edgewise-wound coils consisting of a flat strip or ribbon of conducting material, a flat strip or ribbon of insulating material lying against one side of the strip of conducting material, and a textile jacket fitting said associated strips so as to hold them against relative displacement.

907,299. ELECTRIC HORN. David F. Prall, Chicago, Ill. Filed Jan. 27, 1906. Serial No. 298,317.



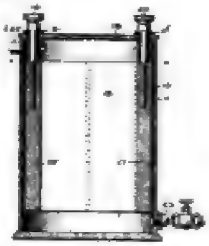
1. An electric horn comprising a resonator, a coupling ring secured to the smaller end thereof, a diaphragm supporting rim separably secured to said coupling ring, a pair of diaphragms, separating means therebetween, and a tongue for rapidly vibrating one of said diaphragms.

906,445. TERMINAL FOR ELECTRIC WIRES. Howard Morgan, Newport, R. I. Filed Feb. 6, 1908. Serial No. 414,478.



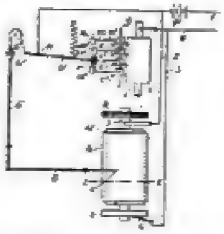
1. A terminal clip for electric conductors, formed of sheet metal and comprising a central body portion, two wing portions extending outwardly from opposite sides thereof and adapted to grip the conductor therebetween, and two spring clamp portions extending from opposite sides of said central portion intermediate said wing portions and adapted to engage with a binding post or the like.

906,867. ELECTRIC FLUID-HEATER. James S. Savage, Harwich, Mass., assignor to General Electric Company, a Corporation of New York. Filed Apr. 4, 1908. Serial No. 425,066.



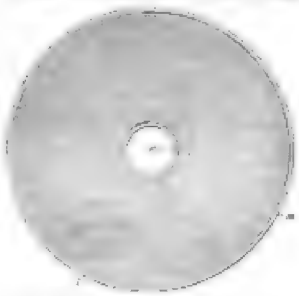
1. An electric heater comprising a plurality of spaced parallel plates, the alternate ones being connected in multiple to form opposite electrodes, and means for maintaining a fluid between the electrodes to complete a circuit.

906,405. MEANS FOR ELECTRICAL TRANSMISSION OF DESIGNS, FIGURES, AND PHOTOGRAPHS. Orestes J. de Ocharan Garcia, Barcelona, Spain. Filed Feb. 29, 1908. Serial No. 418,354.



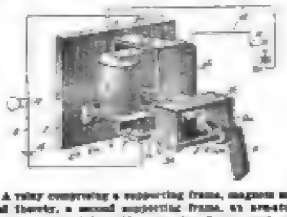
1. In an apparatus for transmitting photographs or designs in relief which represent the shadows or shades, the combination of conductive plates, a relief device, levers respectively adjacent to the relief and conductive plates, and means whereby when the end of one of said levers runs over the relief, the other end runs over the conductive plates; a receiving drum, an electric circuit comprising the receiving drum and varying from plate to plate according to the position of the lever; and means for producing in the current sent through such plate interruptions which may vary in number in a given time

907,383. RECORD-DISK FOR TELEGRAPHONES. James A. Linn, New York, N. Y., assignor to American Telegraphone Company, a Corporation of the District of Columbia. Filed Mar. 23, 1907. Serial No. 364,239.



1. A record-receiving body for telegraphones consisting of wire of magnetic material wound in spiral form with the adjacent convolutions intersecting with each other.

906,881. CIRCUIT-CLOSING RELAY. John F. Wenz, Jr., Denver, Colo., assignor to The Electric Telegraph and Telephone Company, Incorporated, New York, N. Y. Filed May 12, 1908. Serial No. 432,396.



1. A relay comprising a supporting frame, magnets supported thereby, a second supporting frame, an armature pivotally supported in said supporting frame, said supporting frames adapted to be connected to the terminals of a local electric circuit, a contact member carried by the armature and adapted to engage the longest supporting frame at times to close the electric circuit between the magnet supporting frame and the armature supporting frame, and means mounted independently of the armature for locking the armature in its circuit closing position.

Original Electrical Inventions for Which Letters Patent Have Been Granted, for Month Ending December 22d.

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On account of the large amount of inquiries received, it may not be possible to print all the answers in any one issue, as each has to take its turn. Correspondents should bear this in mind when writing, as *all* questions will be answered either by mail or in this department.

If a quick reply is wanted by mail, a charge of 15 cents is made for each question. Special information requiring a large amount of calculation and labor cannot be furnished without remuneration. THE ORACLE has no fixed rate for such work, but will inform the correspondent promptly as to the charges involved.

Name and address must always be given in all letters. When writing only one side of question sheet must be used; not more than three questions answered at one time. No attention paid to letters not observing above rules.

If you want anything electrical and don't know where to get it, THE ORACLE will give you such information free.

TUNER.

(125.) CLARENCE TERHUNE, Ind., asks:

1.—Must I move the slider on my tuning coil up or down for greater wave length?

A. 1.—Move the slider in such a way that you add more wire between the instruments and the aerial.

2.—Is No. 16 iron wire good for aerial?

A. 2.—No; use aluminum No. 14, if possible.

3.—How many volts could be used safely on a ¼-inch spark coil?

A. 3.—No more than 6 volts.

4.—How far would a ¼-inch spark coil send with an aerial consisting of two poles 40 feet high, and wires stretched between?

A. 4.—From ¼ to one mile, depending upon the atmospheric conditions, also the general topography of the country.

5.—Which is the best combination in a E. I. Co.'s "Auto-Coherer," an iron plug and a carbon plug, or two carbon or two iron?

A. 5.—Carbon and iron, with a mercury globule between.

6.—What is the receiving distance of this "Auto-Coherer" with an aerial, as described in Question 4?

A. 6.—100 to 150 miles.

TUNING COIL.

(126.) R. F. ADAMS, Texas, writes:

1.—Where can I obtain salts for electro nickel plating?

A. 1.—From the Electro Importing Co., N. Y. City.

2.—I am making a tuning coil, using No. 18 annunciator. Can you tell me how to bare the wire of insulation where the contacts slide, without having frayed ends of insulation?

A. 2.—We refer you to an article by Mr. Austin in the June issue, "How to Make a Tuning Coil," in which you will find the information you desire.

3.—The above coil will have about 350 turns of wire. Each turn is one meter long. Could I receive from stations having 2,000 meters wave length?

A. 3.—Yes; provided the aerial is sufficiently long.

SPARK COIL.

(127.) PETER SCHAAF, Pa., asks:

Will you kindly tell me whether the spark coil used with a gas engine can be used in a wireless sending outfit, and if it is large enough? About how far would this send?

A.—We cannot tell from your question whether this coil has a primary winding only, as it would if the engine was ignited by a make and break spark, or whether it has a primary and secondary, as it would have if used for jump spark ignition. If the latter you may be able to use it for wireless. How far it would send we cannot tell from the information given in your letter.

WIRELESS QUERIES.

(128.) ALVIN KOLB, Ohio, asks::

1.—Can four separate secondary windings of one-half inch each be so connected as to produce a two-inch spark? If so, give a few details.

A. 1.—Yes; if connected in series, and used on one primary winding.

2.—Will the following transmit messages 12 miles, providing sensitive instruments are used at receiving station: A 2-inch spark coil, tuner, Leyden jars, and an aerial 25 feet high, placed in an attic, the same being made of four strands of copper wire 20 feet long, the land being of clay, and receiving station 300 feet lower than mine?

A. 2.—Yes; provided good ground connections are made at both receiving and sending stations.

3.—Would water in a cistern make a good ground?

A. 3.—Yes; if a large copper or aluminum plate is lowered to the bottom of tank to which ground wire is fastened.

ALUMINUM WIRE.

(129.) H. G. WHITMAN, New Hampshire, writes:

Is aluminum wire, No. 14, bare better for constructing an antennae than copper wire bare of the same size?

A.—Yes; the principal reason for this is that aluminum wire is a good deal lighter than copper wire, consequently the aerial

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is not so liable to be wrecked in a heavy storm and the strain on insulators is very little.

"GROUND" IN AIRSHIP.

(130.) L. H., N. Y., writes:

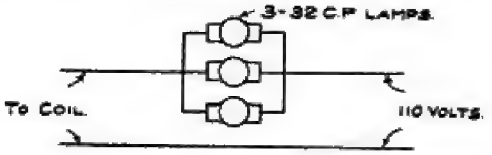
With reference to wireless apparatus on airships, where or how does a receiving instrument find its ground?

A.—Generally the frame work of the airship acts as the aerial and an insulated wire dropped from 50 to 75 feet, as the ground.

SPARK COIL ON 110 VOLTS.

(131.) W. S. Jones, Jr., Pennsylvania, asks:

I wish to know if I can use a one-inch coil on our electric light current? (Direct current). Also if I could use it on the current with lights as per diagram?

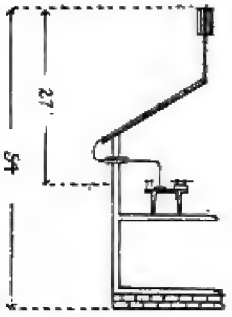


A.—Use three 32-c. p. lamps connected as shown in diagram.

WAVE LENGTH.

(132.) Earl C. Hawkins, Minn., asks:

Should I use the distance 27 feet or 54 feet in computing wave length of my wireless station as per diagram?



A.—Use total length of wire from the receiving instruments to the top of the aerial.

STATIC MACHINE.

(133.) R. M. Atkinson, Jr., Arkansas, asks:

1.—Will the E. I. Co's. static machine operate the small X-Ray tubes advertised in their catalog No. 5?

A. 1.—Yes.

2.—Give data for 1½ inch coil.

A. 2.—Core 7 in. long and 7 1/8 in. diameter; for primary winding, use 10 oz. of No. 14 wire, secondary 5 in. long, 2¾ in. diameter, wound in ten sections with two lbs. of 36 wire. Condenser, 40 sheets tin foil 7 in. by 4 in. Use ten volts four amperes.

WIRE QUERIES.

(134.) O. F. Backhaus, Conn., asks:

1.—Please tell me the size of the enclosed wire.

A. 1.—No. 25 B. & S. gauge.

2.—How much of it would I need in the secondary of a half-inch coil?

A. 2.—The wire enclosed is too heavy for the secondary winding.

TELEPHONE RINGER.

(135.) Lyle R. Pratt, Mont., writes:

1.—I have a one thousand ohm telephone ringer wound with No. 26 German silver single silk covered wire. Please tell me if this would be as well for the secondary of a spark coil as copper wire.

A.—No, German silver wire would not do for secondary of a coil, and it is not considered good for use in a telephone ringer.

VIBRATOR.

(136.) Walter Martin, Ohio, asks:

1.—Where can I obtain a mercury vibrator, also an automatic adjustable vibrator?

A. 1.—From the Electro Importing Co., New York City.

2.—I am making an induction coil. The dimensions are: Core, 1¼ in. thick; the coil 10¼ in. long, 8 in. in diameter; and am going to use two layers of No. 14 single cotton covered wire and 15 lbs. No. 36. What will the spark length be?

A. 2.—We suggest that you use No. 10 B. S. wire for the primary. Spark length will probably be 10-12 in. if the coil is wound in sections, and is properly insulated. If this is to be used for wireless we would suggest that you use No. 33 B. S. wire for the secondary. The spark length would then be much shorter, about 6-8 inches.

WIRELESS INTERFERENCE.

(137.) J. W. Harrison, Ala., asks:

1.—Would a street car line, telephone, and electrical wires that pass in front of my house seriously affect the sending and receiving distances of the "Telimco" No. 2 wireless outfit?

A. 1.—No.

2.—What is the largest spark coil that a 6 volt 4 ampered dynamo will operate to full spark length?

A. 2.—2 in. coil.

3.—What are the dimensions of a 2-in. spark coil?

A. 3.—Core 7½ in. long, 15/16 in. diameter. Primary wound with 12 oz. of No. 14 wire, secondary 5½ in. long, 2¾ in. diameter, wound in 40 sections with 2½ lbs. No. 36 wire. Condenser 36 sheets tin foil, 7 in. by 5 in.; use 12 volts and 4 amperes.

GROUND QUERY.

(138.) Elwood Johnson, Wyo., asks:

While installing an electric light in our cellar the other day I had both wires connected to the socket and a globe screwed in it while one of the wires was connected to the main wire and the other wire was loose. When I was ready to connect the loose wire it happened to touch a water pipe and the light began to light, and what puzzled me is what made it light.

A.—One wire was connected to the light and the other wire of the light when touching the water pipe made a ground, as the earth is a conductor and the dynamo is grounded at the central sation, this completed the circuit through your lamp.

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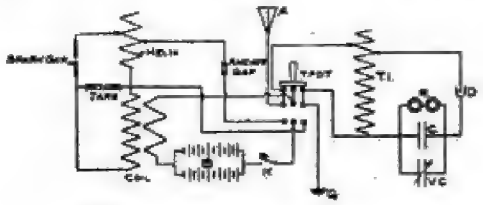
WIRELESS QUERIES.

(139.) A correspondent writes:

I would be very much obliged if you would answer the following questions:

1.—I have a set connected up like this: The transmitter consists of a 1½ coil, 12 dry cells in series multiple, zinc gap, two one-quart Leyden jars and 16 feet No. 12 wire on sending helix. The receiver of 65 feet of No. 21 wire on inductance coil; two 1,000 ohm phones, large fixed condenser, a variable condenser made of four



M.E.

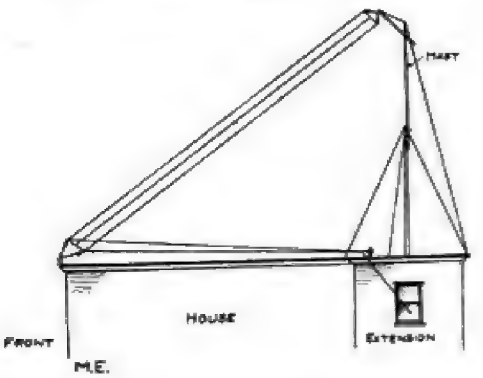
small condensers arranged with plugs like a resistance box, and an electrolytic of the zinc-wollaston type. The aerial is 35 feet high and has a wave length of 185 meters. How far should I be able to transmit and receive?

A. 1.—We figure you should be able to transmit somewhere between 10 and 15 miles, and receive 150-300 miles.

2.—Could the iron pipe mast described in the November issue be set right down on a tin roof if the aerial was well insulated from it, or must it be insulated at the bottom?

A. 2.—It would be advisable to insulate the pipe from the roof as if not insulated it would absorb some of the energy when sending, and might cause a slight "shadow" when receiving.

3.—What is the best way to fix my aerial? It is at present like this:



M.E.

I cannot change the position of the mast or my operating room. Would it be better to run it down to the yard in the other direction and then up to my room? The mast is 35 feet high.

A. 3.—Aerial as shown is all right. We do not advise running aerial down to the yard, and then back to the experimenting room. The only change that probably could be made would be to bring the leading-in wires from the middle of the upper stretch. This would overcome any directive effect.

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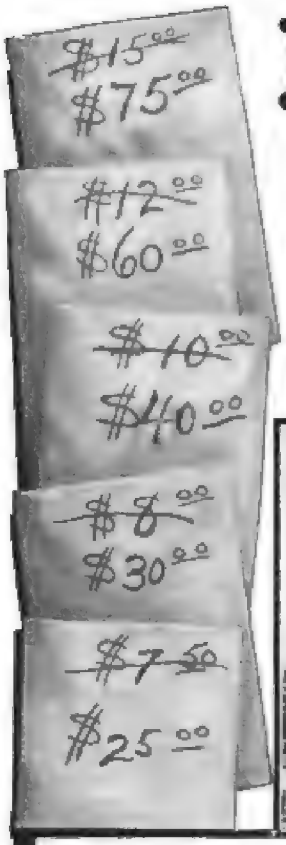

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The difference between $7.50 and $25.00; $8.00 and $30.00; $10.00 and $40.00; and so on up the line is the *proven* difference between the salaries of men before and after receiving I. C. S. training.

It's a fact. The International Correspondence Schools have thousands of unsolicited letters telling of exactly such increases in salary as a direct result of this training. Every month there is an average of 300 men who voluntarily report success attained through I. C. S. training.

Wouldn't you like *your* salary raised? Wouldn't you like a more congenial position? Wouldn't you like to be successful? Then mark the coupon to-day.

Everything now-a-days is on the rise. Clothing costs more; the butcher charges more; groceries are away up. *And the end is not yet.* In fact, everything is going up except the salaries of *untrained* men.

There's *always* a good paying position for the *trained* man. You know that.

Then why not let the I. C. S. help you? It doesn't matter where you live, what you do for a living, or how little schooling you may have had. If you can read and write, the I. C. S. has a way to help you to success—in your own home—in your spare time—without requiring you to give up your present position. Mark the coupon to-day.

The I. C. S. method will quickly enable you to earn a much higher salary *at the occupation of your choice*—just as it has already enabled thousands of other poorly-paid but ambitious men to succeed.

During July 310 students voluntarily reported increase in salary and position through the help of the I. C. S.

Mail the coupon to-day—the I. C. S. will gladly explain it all without charging you a penny.

Remember: The Business of this Place is to Raise Salaries.

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Please explain, without further obligation on my part, how I can qualify for a larger salary in the position before which I have marked X

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Commercial Law	Stationary Engineer
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Advertisements under "Wireless" 5 cents a word. Minimum, 4 lines. Wireless books and blueprints not listed under "Wireless" 2 cents a word.

Advertisements for the February issue must be in our hands by Jan. 25.

ELECTRICAL APPARATUS.

STUDY ELECTRICITY AT HOME—A complete electrical course at home, containing 30-page detail book, 220-page text-book, 200 experiments and over 100 pieces of apparatus. Price, complete, only $5.60. Catalogue "M. E. S." explains this and other remarkable offers. Thomas M. St. John, 848 Ninth Ave., New York.

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SPECIAL. New Rheostat for Wireless, also to reduce currents of lamps, motors, etc., GRADUALLY. Price for January only, 70c.
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LOOK. Twenty dollars will build 20,000 volt, 1 K. W. Transformer. Blueprints and directions for fifty cents. J. H. White, Ross, California.

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Of course we have it. Coherers, Detectors, Auto Coherers, Rheostats, Static Machines, in fact all the Electrical "knick-knacks" you have been looking for. All apparatus carried in stock in St. Louis. Why pay freight and expressage to get goods from the East? Come and look over our stock. HANCE ELECTRIC CO., Olive Street, St. Louis, Mo.

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we have all up to date wireless supplies. We carry more wireless goods for the amateur than any other house on the Coast. Why pay express and freight, when you can get the goods right here at right prices? Detectors, Tuners, Condensers, Spark Coils from 1-2 to 4 inch spark, oscillators, coherers, lamps, static machines, in fact, anything electrical you want. Call or write. It will pay you. PAUL SEILER ELECTRIC WORKS, Market St. San Francisco, Cal.

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Attention: Silicon (fused), large piece, 15 cents. Molybdenite, that wonderful new substance, 10 cents for large piece. Wollaston wire, .0001 inch, 25 cents per inch. Silver Telluride (for detectors), large piece, 10 cents. Enameled wire for tuners, No. 20, 80 cents, No. 24, $1.35 per lb. Aluminum wire, No. 14, for Antennae, wonderfully light and strong, the best yet, 240 feet per lb., 64 cents per lb. Telephone Cords, 2 conductors, with tips for receivers, 3 feet long, 15 cents each. New Graphite Cup for Electrolytic Detectors, 20 cents. Condensers for receiving stations, 40 cents. Tantalum wire, .001 inch diameter, for experimenting with the new Tantalum Detector, 10 cents per inch. Two-cent stamp must be included in above prices if article is to be mailed. ELECTRO IMPORTING CO., 86-z West Broadway, New York.

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FOR SALE. 40 watt hand dynamos, $6.00; 150-ohm relay, $2.00; compound microscope, $1.00, or trade for turning lathe. Roy Poole, 150 Walnut street, Ashtabula Harbor, Ohio.

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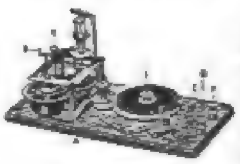

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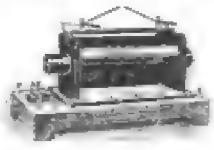

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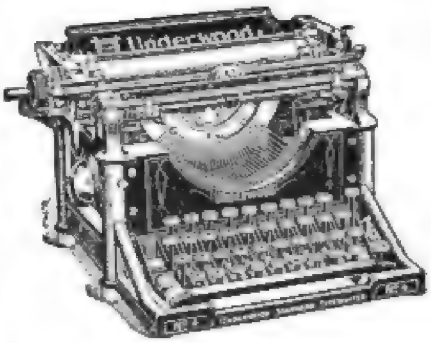

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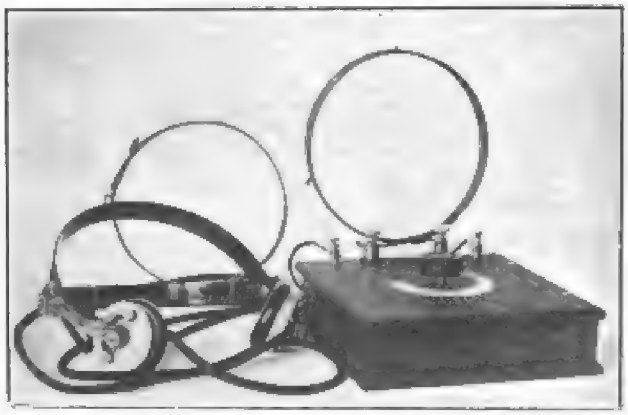

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What wave length are you using
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IT CAN BE USED ALSO AS A RECEIVING TUNER.
You can measure the wave length of every station you can hear.
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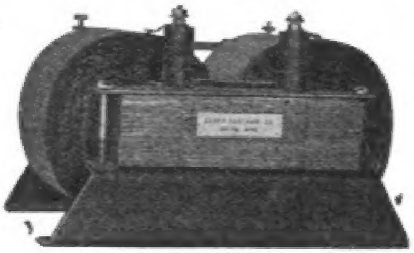

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A 250 watt closed core transformer as powerful as the ordinary 6 in. spark induction coil for wireless work, and costs but $30. It is especially adapted to tuned transmitting circuits, and can be run from any lamp socket giving alternating current. We also build larger sizes up to 10 kw. capacity at moderate prices. Complete parts for a 50 mile tuned transmitting set consisting of 250 watt transformer, large capacity glass plate condenser, oscillation transformer with adjustable primary and secondary inductances, and adjustable spark-gap making an accurate model of a modern commercial station complete for $60.

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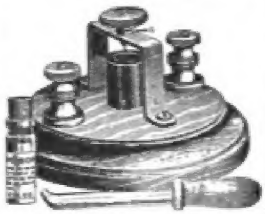

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If you ever wanted a GOOD Detector, here is your chance. Our instrument is positively more sensitive than carborundum, silicon, or other electrolytic Detectors. This is an acknowledged FACT. *Write at once.*
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Infringers cautioned.

Every smoker wants it. Will light in windy weather. Better than matches. A little deodorized wood alcohol once in a while does the trick. Nothing to wear out. Sample mailed upon receipt of 55c. Special prices to dealers in dozen or gross lots. If you wish to make big money this summer write at once to

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They Do Not Realize That They Can

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AUTOMATIC WIRELESS TRANSMITTER

(Continued from Page 349)

This arrangement makes it impossible for Fido to lay down, as he invariably must touch an even and an odd plate, which results in a shock, alone sufficient to make him jump. He is therefore obliged to jump continuously while you are testing at the far end.

To keep the good will of Fido I recommend to let him eat the sausage or the soup bone after completing tests.

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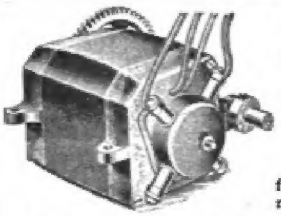

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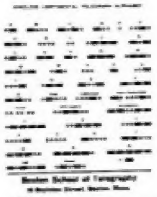

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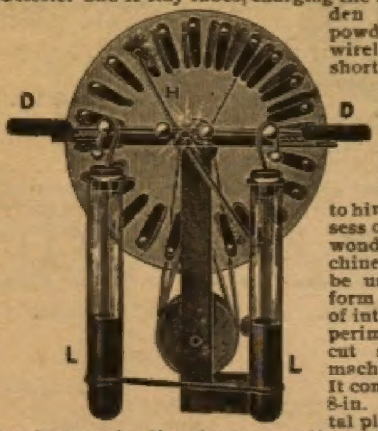
Guaranteed to generate in any kind of weather, no matter, foggy or rainy. The first machine ever constructed which can truthfully claim this. We absolutely guarantee a fat, powerful **3-in. spark** from our new machine It is used successfully to operate Geissler and X-Ray tubes, charging the biggest Leyden jars, firing powder, working wireless sets for short distances raising a person's hair, etc Anybody interested in electricity owes it to himself to possess one of these wonderful machines which can be used to perform thousands of interesting experiments. Our cut shows the machine plainly. It comprises two 8-in. glass crystal plates revolving in opposite directions, two adjustable oscillator and discharging rods and balls D, collectors H and one iron clamp to fasten body to table. Size over all 11x14 in. Weight boxed 8 lbs. Nothing to wear out, no batteries, no trouble, simply turn the crank, the machine does the rest. **Price, complete boxed, $3.75.** If you haven't got our 114 page electrical cyclopedia No. 5, send 2c stamp postage; contains 100 experiments.



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NEW SELENIUM CELL.

(Continued from Page 344)

being a very soft metal, cannot possibly harm the sharp edge of the knife.

The cell should now be tested by connecting a battery and a telephone receiver to the two leads. If the cell has been made carefully, not even the faintest sound should be audible in the receiver. The insulation therefore is perfect. The long edge A, which had been cut by the knife, is then covered by an extremely thin film of pure selenium. For this purpose use only the kind that comes in sticks. It can be had quite cheap now, and has the great advantage of being pure.

As it is by no means an easy matter to apply the selenium, the writer refers readers, wishing to construct the cell to the excellent article, "A Sun Alarm," page 52, May, 1908, issue of this magazine. The full details are given there.

After applying the selenium, apply a thin coat of clear shellac to the film, so that it will not be damaged easily.

If constructed well, the cell will close a relay if a match is lighted three feet away from it.

WIRELESS TROUBLES.

(Continued from Page 351)

"A" from your Helix, which in turn is connected to your Aerial, and place it at different points on your Helix, but not touching it, and also varying the other lead "B." You will notice that a spark will jump from the Helix to the lead, and will jump farther at some points than others. The point where it will jump the farthest is where your open and closed oscillating circuits are in resonance or properly tuned.

If your coil be a two-inch or larger, you may put a sixteen candle power 110 volt lamp in series with your Aerial and vary your inductance until the light appears the brightest, and at that point your transmitter is properly adjusted.

THERMOELECTRIC DETECTORS.

(Continued from Page 359)

tector may be described as a "total-effect" instrument. It has properties which fit it in a special way for the receipt of signals in selective telegraphy and in wireless telephony.

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